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THE

The New Carpenters' Guide,

BEING A

COMPLETE BOOK

OF

LINES FOR CARPENTRY, &c.

ON

METHODS ENTIRELY NEW;

FOUNDED ON

GEOMETRICAL PRINCIPLES,

Wherein the Utility of every Line will be fully exemplified by Practice.

By P. NICHOLSON,

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THE

NEW CARPENTERS' GUIDE.

PLATE I.

FIGURE I. *To draw a perpendicular to a given point in a line.*

A *B* is a line, and *c* a given point; take *a* and *b*, two equal diſtances on each ſide of *c*, and with your compaſſes in *a* and *b*, make an interſection *d*, and draw *d c*, which is the perpendicular.

FIG. 2. *To make a perpendicular with a ten foot rod.*

Let *a b* be ſix feet, then take eight feet and make an arch at *c*, in the point *b*, and in the point *a* with the diſtance ten feet croſs at *c*, then draw *c b*, which is the perpendicular.

FIG. 3. *To let fall a perpendicular from a given point to a line.*

In the given point *c* make an arch to croſs the line in *a* and *b*, and in *a* and *b* make an interſection at *d*, and draw *c d*, the perpendicular.

FIG. 4. *To draw a perpendicular upon the end of a line.*

Take any point at pleaſure, above the line, and with the diſtance *d b*, make an arch *a b c*, and draw a line *a d* to croſs it at *c*, and draw *c b* the perpendicular.

FIG. 5. *To divide a line in two parts by a perpendicular.*

In the points *a* and *b* deſcribe two arches to interſect at *c* and *d*, and draw *c d*, which divides the line in two.

PLATE II.

Fig. 1. *To draw a ſegment of a circle to any length and height.*

Ab is the length, *i h* the height, divide the length *a b* into two parts by a perpendicular, and divide *a h* by the ſame method, then their meeting at *g* will be the center; fix the foot of your compaſſes in *g*, extend the other leg to *b*, and make the arch *a h b*, which is the ſegment.

Fig. 2. *To draw a ſegment by rods to any length and height.*

Get two rods *c e* and *c f*, each equal to *a b* the opening; place them to the height at *c*, and to the ends *a* and *b*, and put a piece acroſs them to keep them tight, then move your laths round the points *a* and *b*, and it will deſcribe the ſegment at the point *c*.

Fig. 3, & 4. *To deſcribe a ſegment, having a piece to the length of the opening, and to half the height.*

In fig 4. *a b* is the length, *c d* the height, *a b c* is the form of the piece: in fig. 3 of the ſame dimention, put in two nails at *a* and *d*, and deſcribe one half; then move the nail out of *a*, and ſtick it in the point *b*, then deſcribe the other half, which is the beſt method of any.

Fig. 5. *To deſcribe a ſegment arch to any height and length, by interſecting lines.*

A b is the length, *c d* the height, take *c e* double the height, and draw *e a* and *e b*, and divide *e a* and *e b* into any number of even parts, as 8, then draw 1 1, 2 2, 3 3, 4 4, 5 5, 6 6, 7 7, 8 8, which will form the ſegment.

Fig. 6. *To deſcribe an oval to any length and width given.*

Let *a b* be the longeſt diameter, and *c d* the ſhorteſt; put one foot of the compaſſes in *e*, extend the other out to *c*, and draw the arch *c* 3, then divide the difference, that is, *b* 3, into three, and ſet one within to 4, then take *b* 4 and ſet it on each ſide of *e* to 4 and 4, then take the extent 4 4 and deſcribe two arches to interſect at *f* and *g*, then draw *f i* and *f k* through the points 4 and 4, and *g h* and *g l* through the ſame, then *f g* and 4 4 are the centers which will deſcribe the oval.

Fig 7. *To deſcribe an elipſis by ordinates.*

Make a ſemicircle on the length *a b* and divide it into any number of equal parts, as 16, and on the end at *a*, make *a* 8 perpendicular, and equal to half the width, and draw the ordinates through all the points in the ſemicircle, and draw the line 8 1 to the center, then *a* 1 8 will be a ſcale to ſet your oval off; take 1 2 from your ſcale and ſet it from 1 to 2 in your oval both ways at each end, then take 1 3 in your ſcale, and ſet it to 1 3 in your oval, and find all the other points in the ſame manner, then a curve being traced through theſe points will be the true elipſis.

PLATE III.

FIG. 1. *To make an ellipſis with a ſtring.*

Take half the longeſt diameter *a b*, that is *a g*, and with that diſtance fix the foot of your compaſs in *c*, and croſs *a b* at *e* and *f*, ſtick in two nails or brads, then lay a ſtring at *e* and *f* to come out to *c*, then fix a pencil at *c*, and move your hand round, keeping the ſtring tight, will deſcribe the ellipſis.

FIG. 2. *To deſcribe an ellipſis by a trammel.*

1 2 3 is a trammel rod, at 1 is a nut with a hole to hold a pencil in it; at 2 and 3 are two other ſliding nuts; make the diſtance of 2 from 1, half the ſhorteſt diameter of your ellipſis, and from the nut 1 to 3 equal to half the longeſt, the points 2 and 3 being put into the groves of the ſame ſize, then move your pencil round at 1, and the pencil at 1 will deſcibe the true curve of an ellipſis.

FIG. 3. *The ſide of a polygon being given, to find a circle that will contain that ſide any number of times.*

With the diſtance of *a b*, the given ſide, make the arch *a c* and *b c* and divide either arch, as *a b* into ſix equal parts; put the foot of your compaſs in *c*, turn 1 up to 1, and 2 to 2, &c. then 1, 2, 3, 4, 5, and 6 will be centers for 7, 8, 9, 10, 11, and 12 ſides.

FIG. 4. *To make a triangle, having the three ſides given.*

A b, *b c*, and *a c*, are the three given ſides, take the given ſide *a b*, and apply it to *a b* on the figure; then take *a c* and make an arch in the point *a*, and in *b*; take *b c*, and make an arch to croſs the former, at *c*, and draw *c a* and *c b*, which will be the triangle.

FIG. 5. *To divide a line in the ſame proportion as another is divided.*

D a, is a line given already divided, and *d e* is a line to be divided in the ſame proportion, making any angle at *d* join *a e*, and draw *b f* and *c g*, parallel to *a e*; then *d e*, is divided at *f* and *g*, as *a d* is at *b* and *c*.

FIG. 6. *To do the ſame by an equilateral triangle.*

A b is the given divided line, take *c d* the length as you would have divided; *d e* is the ſame length, and is divided in the ſame manner as *a b*, which is plain.

FIG. 7. *To make an octagon the neareſt way out of a ſquare piece of wood.*

Draw the diagonal of the ſquare to croſs at *e*, fix the foot of your compaſs in *c*, and make an arch *f e g*; then ſet your gage to *d f* or *b g*, which will gage off each angle.

PLATE IV.

BRICK GROINS. DESCRIPTION.

A, *a*, *a*, *a*, &c. is the plan of the piers which the vault is to ſtand upon, *a b* is the end opening, which is a given ſemicircle; in this *b c* is the opening of the ſide arch, which is to come to the ſame height as the end arch *a b*: fix your centers over the body range, fig. A, as ſhown in the ſection at C, then board them over. In fig. A is the manner of fixing the jack ribs upon the boards, which likewiſe ſhows at C.

To find the mould for the jack ribs.

Take the openings of your arches in fig. A, that is *a b* and *b c*, and lay them down in fig. D, at *a b* and *b c*, to make a right angle. Divide one half of the given ſemicircle E, into five parts, and ſquare them acroſs 1 1 1, &c. to cut *d b* and *d c*, the diagonals, in 2 2 2, &c. and through the points 2 2 2, &c. draw lines parallel to 1 1 1, &c. the baſe of E both ways towards F and G; ſtick in nails at 1 2 3 4 5 in E, and bend a thin ſlip of wood round them which mark with a pencil at every nail; this ſlip of wood being ſtretched out from *d* 1 2 3 4 5, and ſquared over to G, will interſect the other lines in ſmall ſquares: a curve being traced through the diagonals of each ſquare, will give a mould for to ſet the jack ribs.

How to fix the jack ribs.

Bend your mould G, from *d*, to the crown at *e*, in fig. A; that will give the edges of your boards: then fix a temporary piece of wood, level upon the crown, in the direction of *f f*, and let it come the thickneſs of your boards lower than the crown, then it will give the height of your jack ribs, which is a very ſure method of placing them.

To find a mould to cut the ends of the boards.

The rib F is traced to the height of E, or got by a trammel, which will be fully exemplified in the following plates. Take the parts round F, and lay them out to 1 2 3 4 5; then H will be got in the ſame manner as G, which will be a mould to cut the ends of your boards that goes upon the jack ribs againſt the body range.

FIG I. *Is an eaſy method of getting the monlds when both arches are the ſame opening.*

Take half the opening of the arches, whatever they are, and draw a quarter circle, and divide it into ſix; bend a ſlip round it to take its parts, then ſtretch it out upon the baſe from 1 to 6, and ſquare over your points 1, 2, 3, &c. Through the points in the arch draw the lines on both ſides the other way, and being traced as before, gives both moulds, being the ſame in this.

PLATE V.

PLAISTER GROINS.

In fig. A is the plan of the work, which ſhows how the jack ribs is to come againſt the angle ribs, and B is the given rib over *b c* in the plan.

To deſcribe the ribs.

Divide the opening of each rib into ten parts; that is, of C D and E; and ſo trace them from B the given rib.

To back the angle ribs each way.

Take from the plan *a a*, as you ſee by dotted lines up to C, the diſtance 1 *b* at the bottom, and ſet them in the parallel directions, 1 *b*, 1 *b*, 1 *b*, &c and the plan at the other end will give 1 *c*, 1 *c*, 1 *c*, &c. in the ſame manner; which being traced and backed off, will be half the thickneſs of the angle rib, the other half D is found in the ſame manner; then the two halves being joined together, will complete the rib.

How to lay out the ribs in practice, and back them by the tramel.

Set the diſtance of your firſt pin from your pencil on your tramel rod, to the height of your groin, and the diſtance of the ſecond pin from the pencil, to half the opening of your angle rib, and deſcribe the elipſis 1 1 1, &c. at C; then ſet the diſtance *b* 1 on the bottom of your hip, and move the center of your tramel from 5 in the center over to *b*, and deſcribe the quarter of an elipſis *b b b*, &c. which will be the backing of the hip at that place, and will come out to nothing at the top. The other quarter round *c c c*, &c. is backed in the ſame manner, by taking 1 *c*, and placing it from 5 in the center to *c*, then move the center of your tramel from *b* over *c*, and deſcribe *c c c*, &c. which will back the other quarter, and being joined together as above, it will be completed.

To back the ribs by a hip mould.

Move your mould in a parallel direction along 1 *b* at bottom, and 1 *b* at top will likewiſe let you know how much is to come off by backing.

FIG. F. *To find the angle ribs of a groin when a window is cut into it, of a given height, ſo that the angles may be ſtraight upon the plan.*

At the other end of fig. F, is the manner of fixing this ſort of groins, the pieces *d d*, *d d*, &c. for to fix the angle ribs *a c*, *a c*, &c. to them. From what has been ſaid on this ſubject in the two laſt plates, I hope the Reader will excuſe me if I ſay no more in this, becauſe the methods are much the ſame.

PLATE VI.

Fig. A is the plan of a Welſh groin, ſhewing how the ribs are to be fixed. As all the arches here are ſemicircles, their meeting will make the angle ribs *d d d*, and *d d d*, &c. crooked upon the plan, as will appear by the lines under: the ſtraight pieces *e e*, *e e*, &c. are let into the body ribs *f f*, to take the angle ribs at the point *d*, to the height of the leſſer ſemicircle *a c*, or C.

To find the angle rib E.

Take *a b* in B, from *a b* in the plan fig. A, and take *a c* from *a c* in the ſame, at right angles to *a b*; then deſcribe the ribs B and C. Divide one half of C into five parts, and through theſe points draw the lines 2 1, 3 1, 4 1, &c. to E, at right angles to *a c*, and through the points 2 3 4 5 and 6, draw lines to *a i*, parallel to *a c*; put the foot of your compaſs in *a* and circle them round to *a k*, from thence draw them parallel to the baſe of B; then draw them from the arch B, till the interſect in the points *a b c d* and *e* will give the place of the angle when traced. Let the baſe of E, 1 1 1 1 1, be parallel to *a a*, the extremes of the angle, then draw the lines 1 2, 1 3, 1 4, at right angles to 1 1 1 1 1, which being traced through theſe points will give the angle rib.

To back the angle ribs, or to bevel them to range one way.

The internal ſweep of F and G is got from E, and the plans *g* and *h* is form'd from the bevel at E, which is to the thickneſs as you would have your angle rib, making proper allowance for its being crooked, which will give the backing one way.

To find a mould D *to bend round the inſide of* F *and* G, *ſo that it ſhall form the angles, to ſtand perpendicular over the points a b c d and e in the plan.*

Trace the mould D from *a b c d* and *e*; that is, take 1 *a*, 1 *b*, 1 *c*, &c. and place them on each ſide of D to 1 *b*, 1 *b*, and 1 *c*, 1 *c*, &c. which will give the crooked edge of the mould.

Note Such ſort of groins, and the grand effect of them, may be ſeen under the gate-way of the Royal Academy, in the Strand; in Portland Chapel, and in many other buildings about London.

PLATE VII.

Fig. A is a circular groin, ſhewing at each end how the work is to be fixed. I have ſhewed a crown piece in this, which will make it a great deal ſtronger, and leſs trouble in fitting up the jack ribs, at B ſhews the fixing of the ribs, circular upon the plan, according to the groin; but as a ſtraight rib may be made to range in any caſe to a circular one, and will ſave a great deal of trouble in the workmanſhip; therefore, C ſhews how to fix it with ſtraight-ribs upon the plan, in the ſame manner as the circular.

To get out the jack ribs D E F G H *and* I.

Take from C the openings *c c*, *d d*, and *e e*, &c with the bevel of each place, and place them in D E F &c. at *c c*, *d d*, and *e e*, &c. which would be the plan of each, if continued out; then the body ribs being ſemicircles, as at N, half the diameter will be the height of all the ribs, and the plans ſhow the length of each rib, which ſtruck and back'd off with a tramel, will give the jack ribs.

To find the angle ribs K *and* L, *and their backing:*

In fig. A, divide the opening each way into ſix parts, then your compaſs being fixed in the center of your groin. circle them round as you ſee from the points 1 2 3 4 5 and 6, then draw lines through the points 1 2 3 4 5 and 6 to the center, then trace your angles *b c b*, and *b c b*, and draw a chord line for each half, and from the points of interſection in the angle line, draw the ſmall lines at right angles to the chord lines, as at *b o* 1 2 *c*, &c. and place each to the baſe of K & L, divide the given ſemicircle N, in fig. A, into ſix; or half of it into three parts, the ſame as the others, and take the two chord lines *b c* and *c b*, with their diviſions, and make them the baſe of K and L; then the ordinates being drawn up in both, and traced from N will be the angle or hip ribs; theſe two ribs cannot be got true by a tramel, as the ribs D E and F &c. are got. Bind a ſlip of wood round K and likewiſe L, which mark at the points 1 1 1 1 1, &c. which being ſtretch'd out at *m* and *n*, will give two moulds to bend round K and L, which will give the place of the angle ſo as to ſtand perpendicular over the plan.

Fig. M is an irregular groin, the methods of doing this is the ſame as the others, by taking all the different openings, as may be clearly ſeen from the manner of getting the jack ribs in the laſt.

PLATE VIII.

LINES FOR ROOFING.

A b c d is the outline of a roof, *i x* the height, and *w x*, and *x y*, the common rafters, that is the out line of them, and *w y* the width, which are given.

To find the length of the hip rafters.

On the ridge line *q r*, ſet up *c q* or *q d*, from *q* to *m*, and through the point *m*, draw *c m* and *d m*, continued out to *z*, &c. make *m z* equal to the height of the roof, and draw *d z*, which is the length of the hip rafters. All the other hips are found in the ſame manner.

To find the length of the hip rafters another way.

Suppoſe you would find the length of the hip over *m d*; take the length of *m d*, and ſet it from *i* to *t*, and draw *t x*, which is the length of your hip.

To find the backing of the hips.

Draw *e f* at right angles to *m d*, and put the foot of your compaſs in 1, and draw a circle to touch the hip line, and where it interſects at *g*, draw *g e*, and *g f* the backing at that place, the others are the ſame.

To find the down bevel of the purlins, when one ſide is parallel to the back of the rafters

Square the line *h i*, from *x y*, put your compaſs in *i*, and circle *h* to *l*, and draw *h n* and *l p*, parallel to *q r*; let *n o* be at right angles to them, then draw *m o*, and D is the bevel required. The bevels E and F are found in the ſame manner.

If it was required to find a bevel in any other direction, it is only drawing the line *i h* in the direction as your purlin is placed. The other lines are done in the ſame manner as the above.

Fig B and C are pitch ſkylights, which are of the ſame nature as roofs; G the mitre; and H a backing mould.

PLATE IX.

Fig. A is the plan of a niche; the above is the elevation of it, which ſhews how the quarterings are to be fixed.

To get out the ribs for the head.

Take *a c*, *a d*, and *a e*, in fig. A, from *a* to the neareſt corners of *c d* and *e*, and make them the baſes of B C and D, and to *a b* their common height, each being deſcribed by the tramel, which will be the ribs.

To back the ribs.

The rods of your tramel remaining the ſame in E and F, as they were in deſcribing B and C; draw the plan *c*, in fig. A upon the bottom of the rib E, as at *c*, then move the center of your tramel towards *e*, ſo much as *c* is off the ſquare, it will deſcribe the backing. The rib F is back'd in the ſame manner.

Note. All elliptical domical ribs are deſcribed and back'd by this method, or any other thing of the elliptical kind that comes to one common height.

G H and I ſhews how to get the ribs by ordinates, which is not ſo well adapted for the practice as the tramel is, but it is univerſal, and will anſwer in any caſe, whatever may be the form of the rib.

Given the form of a common bracket in fig. K, *that is* L, *to find the external and internal brackets* M *and* N.

The form of L, is in general given by a Plaiſterer; take the extent of your angle *a b*, or *c d*, with a rod, and place one end of it in *e* at L; and bring the other to touch *f i*; it will croſs the parallel lines in *k* and *l*, which mark upon your rod; that will give the baſes of M and N. The heights being ſet up, as in L, will be the brackets, which are both the ſame; only their backings are different, as appear by the plans under them.

O and P are cove brackets; that of P is the angle bracket over *g h*, which is traced from the given bracket O, or got by a tramel.

PLATE X.

Fig. A ſhows how to glue up the head of a niche in five or more blocks, or rings, according as the Workman ſhall ſee neceſſary.

Fig. B is the plan of a circular dome, C the ſection, which ſhows at *d* and *d* how to ſquare the purlins, ſo as to make them tend to the center, or to ſtand ſquare to the ſurface of the dome; but there is not the leaſt occaſion for the ſquaring of any purlins, which is attended with a deal of trouble, and waſte of ſtuff, you need only to get them out the ſame ſweep as the dome itſelf is of, and quite ſquare at the ſame time, which purlins, being fixed between your ribs, the middle of them will be above the level, at the joints; but will be in the true ſurface of the dome, and ſtand in a plain ſurface to the center.

To find the form of a board to bend upright to the crown.

Divide E into eight parts, that is, one quarter, or any other number, the more the truer; ſet one on the other ſide of 1 1 1, &c. draw 7 *e*, and 1 *e*, to *e* in the center, take the diviſions 1 2 3 4, &c. round E, and lay them from 8 in F along the line 1 1 1 1, &c. then circle them round *e*, and take 1 1, 1 2, 1 3, &c. in E, and ſet them off on each ſide to 1 1, 1 1, 1 2, 1 2, 1 3, 1 3, &c. thoſe when traced will give the form of the board F.

To find the centers for bending the boards horizontal in D.

It is evident, the more parts any thing of this nature is divided into, the truer it will be; but I ſhall only divide it into four for the ſake of conveniency; draw 4 3, to meet the perpendicular at *d*; and 3 2, to meet at *c*, &c. then *d*, *c*, *b*, *a*, will be the centers for the boards, G, H, I, K.

To find the angle ribs of polygon roofs.

In fig. L, M is a given rib in the form of a cavato, divide it into five parts, and ſquare them acroſs the points 1 1 1 1 1, out to 1 2 3 4 5, and from 1 2 3 4 5, ſquare them up to N; then N being traced to M, that will be the angle rib. The backing will be found the ſame as directed in the foregoing Plates.

To find the covering.

Take the parts 1 2 3 4 5, round M, and ſet them along 1 1 1 1 1, in O, and take 1 1, 1 2, 1 3, between M and N, and ſet them in O, which being traced, will give the edge of the mould P, to cut off the ends of your boards.

Note The angle rib and boarding of fig. Q is found in the ſame manner.

PLATE XI.

Fig. A, is the plan of an elliptical dome; B is the longeſt ſection, C the ſhorteſt ſection; at *a a* in B, and *b b* in C, ſhows how to ſquare the purlins, ſo that one ſide may be fair with the ſurface of the dome; the dotted lines from *a a* in B, and *b b* in C, ſhows how to get the length and width of the purlin in fig. A; but if the ſides of the purlin was made to ſtand perpendicular over the plan, the ſweep of it would be found in the ſame manner as before; then it would require no more than half the ſtuff that the other would, and take only half the time in doing it, which is a conſiderable advantage.

How to proportionate the inſide curb for the ſkylight, ſo as it ſhall anſwer to the ſurface of the dome.

Draw the diagonal *i l*, and *k m*, in fig. A; and let *h e*, or *g f*, be the width, then *h g*, or *e f*, will be the true length of the curb; becauſe every ſection parallel to the baſe will be proportional.

To find the ribs for this dome.

The ribs in this are got in the ſame manner as the ribs for a niche, as directed in page 9, and if the reader underſtands that, he muſt know this.

To find the form of a board to ſtand in any place of this dome, to be bent up to the crown.

Suppoſe you would find a board over *a b c* in the plan; divide D into three parts round *a b c d*, and draw *a c*, *b c*, *c c*, and *d c*, to the center at *c*; then take the triangle *a b c*, in D, and lay it down at *a b c* in G; then draw the line *c* 1 1 1, &c at right angles to *a b*, and deſcribe a rib G to the height of the dome, and the length to the perpendicular of the triangle *a b c*, and divide it into five equal parts, lay them along the line 1 1 1 &c. in H, and prick the mould H from the triangle *a b c*, as ths letters are marked. The board K will be found in the ſame manner.

Note. In the practice, you are to divide one quarter of this dome into as many parts as you think the breadth of a board will contain; and the boards, when got out by this method, will fit to a very great exactneſs; this is only into three, that the parts may be clearly ſeen to learners.

P L A T E XII.

A b c d in fig. A, is the opening of a ſquare ſtaircaſe, which is to be bracketed up into the circular curb of a ſkylight, which ſhows in the plan fig A, and at B, the ſection: every bracket is of the ſame ſweep throughout, but cut ſhorter off the under end, according to the plans of each, as ſhows in the plan fig A, and in the ſection at B.

To find the curve B *on each ſide of the ſtaircaſe, for the under ends of the brackets, ſo that it ſhall correſpond in every height to the brackets.*

Draw the lines *o* 1, 1 1, 2 1, 3 1, 4 1, at right angles to 1 1 1 1 1, the baſe of C, which is one of the brackets; put the foot of your compaſs in *e*, the center of fig. A, and circle them round to 1 1 1 1 1, the baſe of B; and from theſe points draw them up perpendicular towards *o* 1 2 3 4, then prick B off from C, which will give the curve or foot of the brackets.

Fig. D is the plan for real ſemicircular domical finiſh, and E the ſection. This, when executed, has a much grander and nobler appearance than that above.

To get the ſweep of the ribs.

Place the foot of your compaſs in the center of fig. D, and draw a circle to touch the angles of the ſtaircaſe at *a b c d*, which will be the ſweep of every rib.

To find the bottom ends of the ribs on each ſide of the ſtaircaſe.

Draw the ſemicircle E, to the opening of the ſtaircaſe, which will give the bottom of the ribs.

To find the bottom of the ribs for a ſegment finiſh.

Let *f i g h e* be a ſegment, or the ſweep of the ribs; draw the lines *a b* and *d c* out to cut it in *h* and *i*, then draw *i h*, and deſcribe a ſegment of a circle upon *b c*, to touch *i h* in *k*, for the bottom of the ribs.

PLATE XIII.

Fig. A is the plan of an elliptical domical ſkylight, over a ſtaircaſe; B and C are the ſections which ſhows how to place your ribs.

How to proportionate the length of the inſide curb to any width given.

Proceed as directed in *Page* 11, for an elliptical dome, that will determine the true length to the width.

How to proportionate the circumſcribing ellipſis, to paſs through the angles at a, b, c and d, to have the ſame proportion as a b, and b c, the ſides of the ſtaircaſe.

Deſcribe the quarter of an ellipſis *i k l*, to touch the ſides of the ſtaircaſe; draw *i k* to cut the diagonal *a c* in *k*, and through the point *a* draw *a m* parallel to it, which will give the length; likewiſe draw *k l* to cut *a b* in the middle, and *a n* parallel to it; then the width will alſo be determined by ſetting the ſame from the center to the other two ſides.

To deſcribe the ribs.

The rib over *n* to the center of the tramel in fig. A, is a given quarter of a circle, and of courſe all the other ribs muſt come to the ſame height with it. Suppoſe it was required to find a rib over *d p*, you muſt take the full extent from *d* to the center, and deſcribe the quarter of an ellipſis D; then the part over *d p* will be as much of it as is wanted: in the ſame manner E will be deſcribed, and the part over *i o* is what is wanted of this rib; the ſame letters are marked upon the baſes of D and E, as they are in the plan, fig. A. Every other rib is deſcribed in the ſame manner.

To find the ſections on each ſide of the ſtaircaſe for the foot of the ribs to ſtand upon.

Deſcribe the ſemicircle C, to *c b*, the width of the opening of the ſtaircaſe, which will give the bottom of the ribs on that ſide; and deſcribe a quarter of the ellipſis B, for the bottom of the ribs on the other ſide, to the ſame height as C.

PLATE XIV.

A and B ſhows the method of truſſing girders, as is uſed by the greateſt maſters at this time.

C is a horizontal ſection of B.

D is a ſection of the butment, by cutting acroſs *a b*, in A.

E and F ſhows the two ſides of the king bolt, at *c* in A, which is made with a wedge-way upon the top, ſo that it may force out the truſſes upon the butments.

TO TIGHTEN THE GIRDERS,

Your truſſes ought to be let cloſe in to the ſides of the girder, about an inch and a half on each ſide, and the head of your king bolt ought to be greaſed, ſo that it may ſlide freely paſt the ends of the truſſes; firſt ſcrew your girder cloſe ſide ways, then proceed to turn the nut of the king bolt, and another perſon to hit the head at *c* of the king, with a mallet, which will make it ſtart every time it is hit, and give freſh eaſe at every turning of the nut, ſo that you may camber the girder to any degree, as you ſhall have occaſion for; but generally not above three quarters of an inch in twenty feet.

Note. The ſections D E and F are to one eighth part of the real ſize.

☞ I hope the reader will excuſe me in the two or three pages that follow, for the Explanation not facing the Plates, as there requires no lines to be found out in them.

PLATE XV.

This contains the moſt ſimple conſtruction of roofs.

Fig. A is calculated for a ſmall building; at one end of the colar-beam is the Carpenters' boaſt, what they term a dove-tail tenent; but I think rather a rule joint, as it is worked out to a center. This roof will do for an extent of 20 or 25 feet.

Fig. B is a truſs for a roof, the purlins to be notched upon the principle rafters, as will be deſcribed in the following plates of ledgement roofs: This roof may be well calculated for an extent of 30 or 35 feet, the height one fourth of the ſpan for ſlate coverings.

Fig. C is a ſimple conſtruction of a roof, for the ſegment finiſh of a dome, which will anſwer to any of the above extents.

PLATE XVI.

Fig A is a roof for the purlins to be framed in, and the common rafters to come fair with the principles.

Fig. B is a roof calculated for a greater extent than any of the foregoing roofs, and may well extend 50 or 60 feet. Here likewiſe ſhews the connection of the roof in the walls.

Fig C is a roof ſupported by two queens, inſtead of a king, to give room for a paſſage, or any other conveniency in the roof.

PLATE XVII.

This roof is calculated for a ſpan of ſeventy or eighty feet.

You will obſerve in this, and the foregoing roofs, that the truſſes are the ſame in number, as the purlins which they have to ſupport; for what an abſurd thing it is to give a roof more ſtrength than neceſſary, and on the other hand, the conſequence will be dangerous, if too weak.

As it happens frequently in buildings that walls run acroſs the roof; in ſuch caſes, there will be little occaſion for truſſing the roof, then the purlins may be truſſed, which will ſave one or two pair of principles, which is a conſiderable advantage.

Fig. B is a roof of this kind, which ſhews the ends of the purlins, and C ſhews how to truſs the purlin.

D E and F are the methods of ſcarfing of timber.

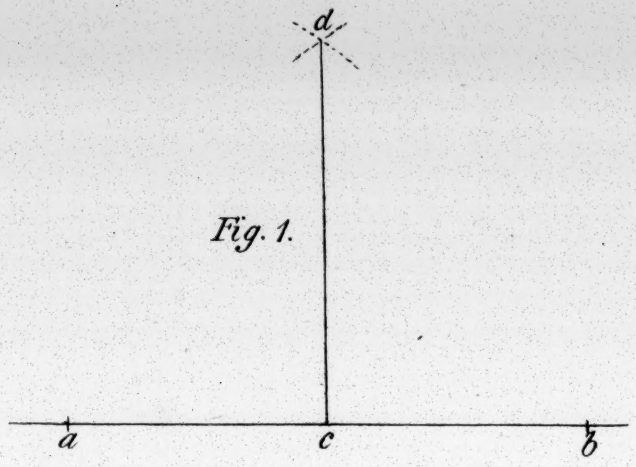
PLATE XVIII.

Fig. A is a curb roof, with a door in middle of the partition; the beam *a b* to run quite acroſs the pole plate, to be tenented into the beam at *a* and *b*, the ſtory poſt *a c* and *b d* likewiſe to be let in with a ſmall tenent to the beam, as it ſhould project about an inch on each ſide of the beam; to take the ſhoulder of the pole plate, which will diſcharge the weight from the tenent.

Fig. B is a roof, calculated for two rooms.

Fig. C ſhows the method of framing of a bridge floor.

Plate 1.



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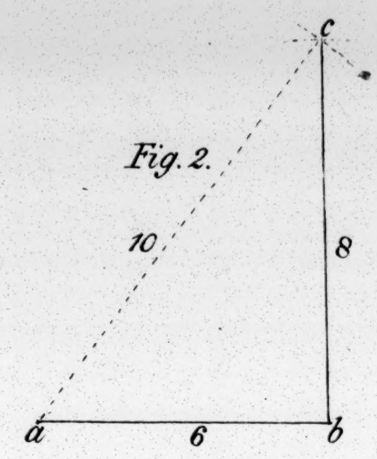

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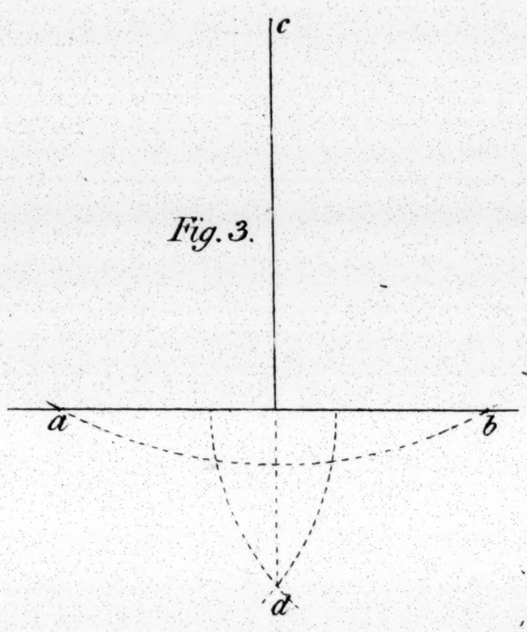

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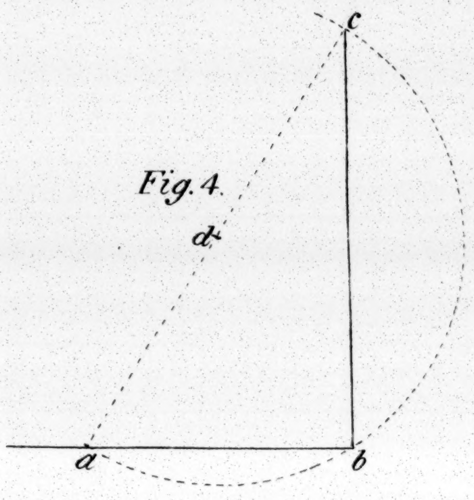

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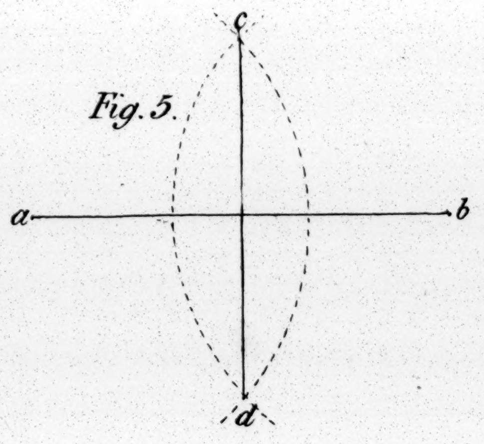
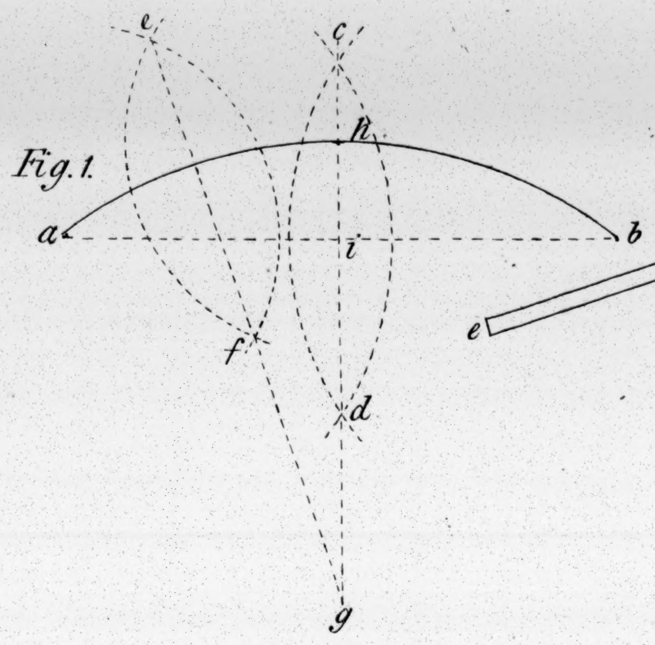


Fig. 5.

Plate 2.

Fig. 1.



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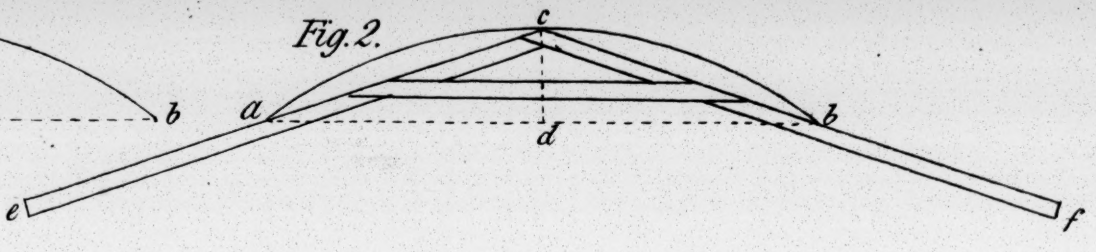

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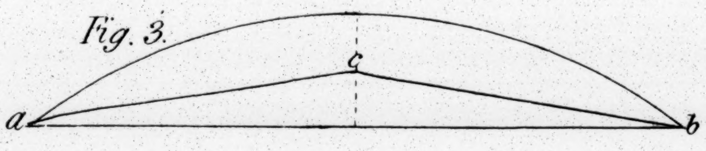

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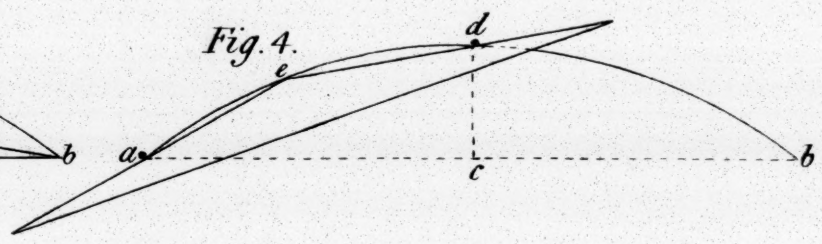

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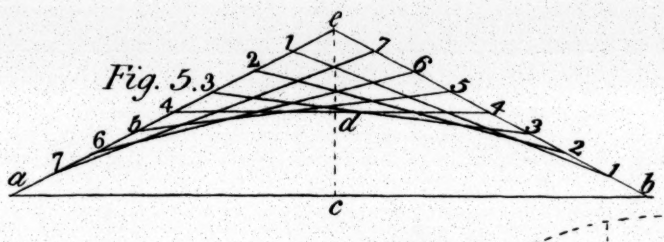

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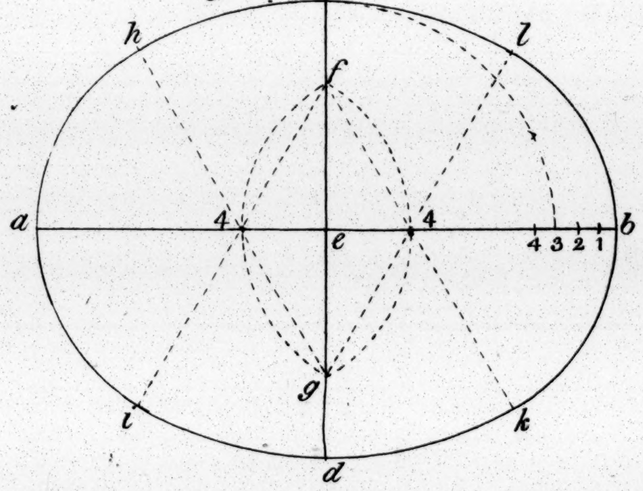

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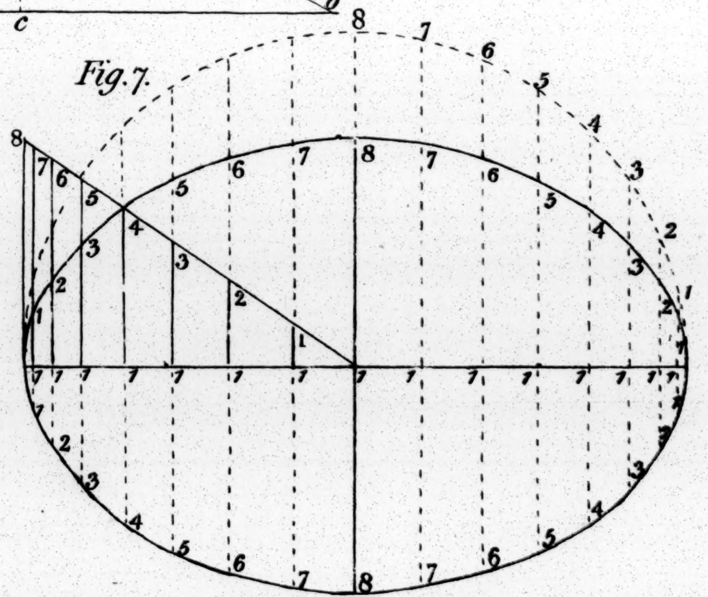

Plate 3.

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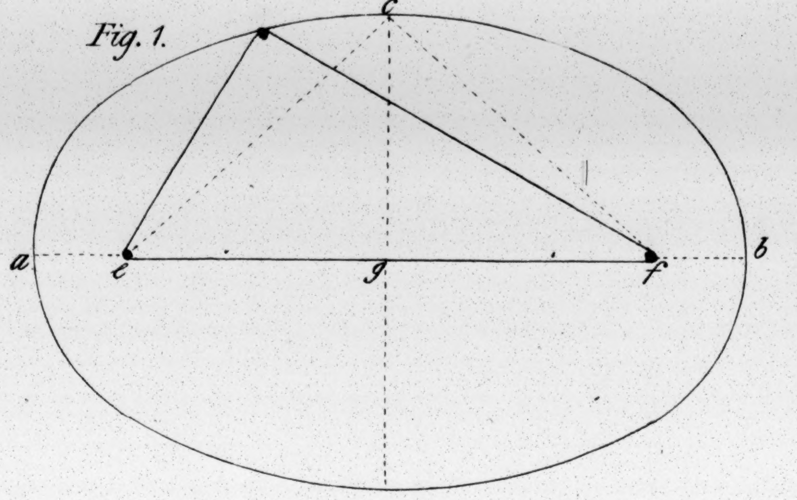

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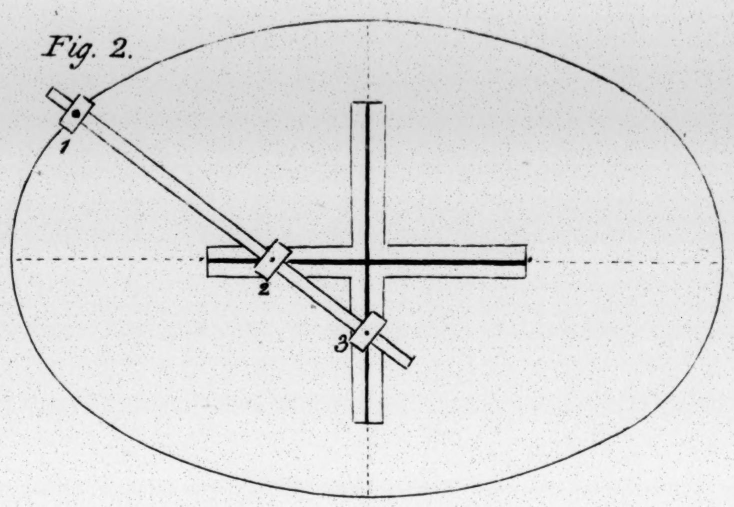

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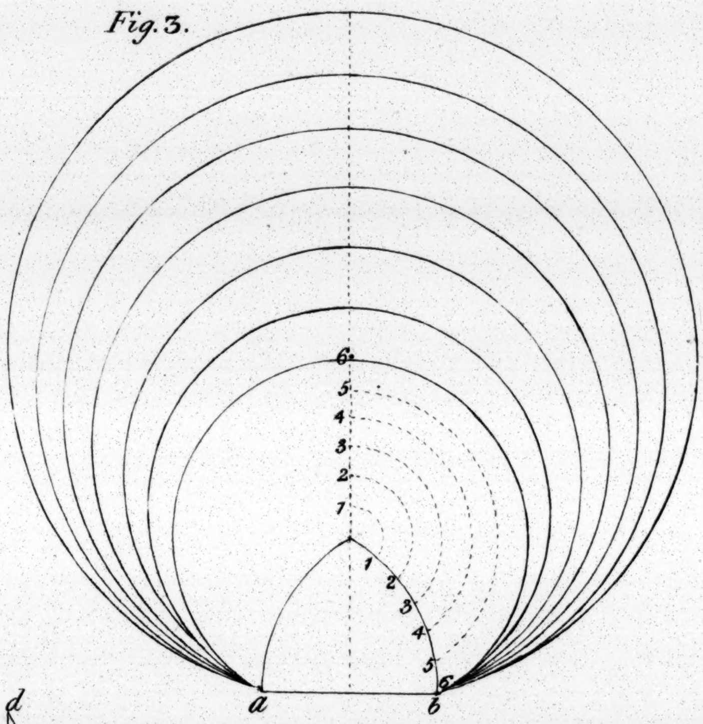

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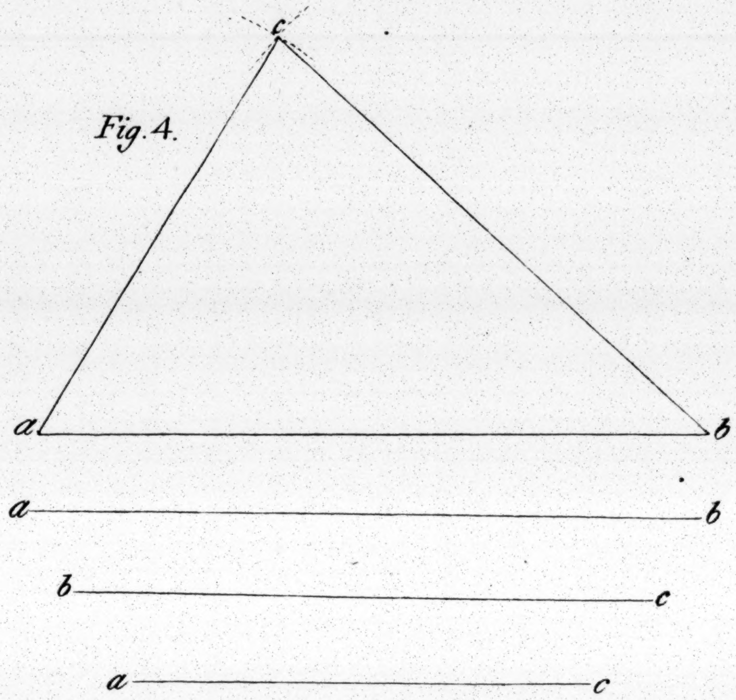

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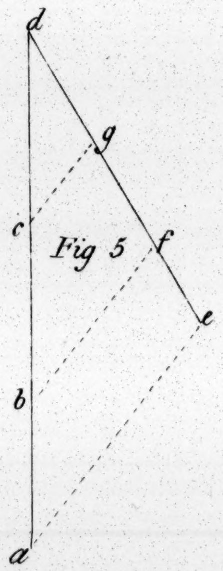

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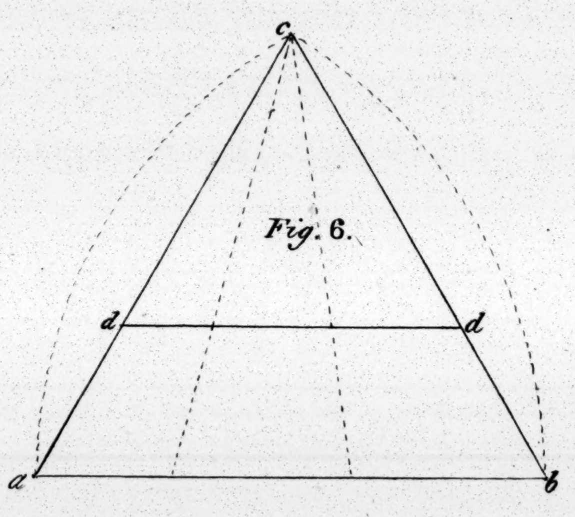

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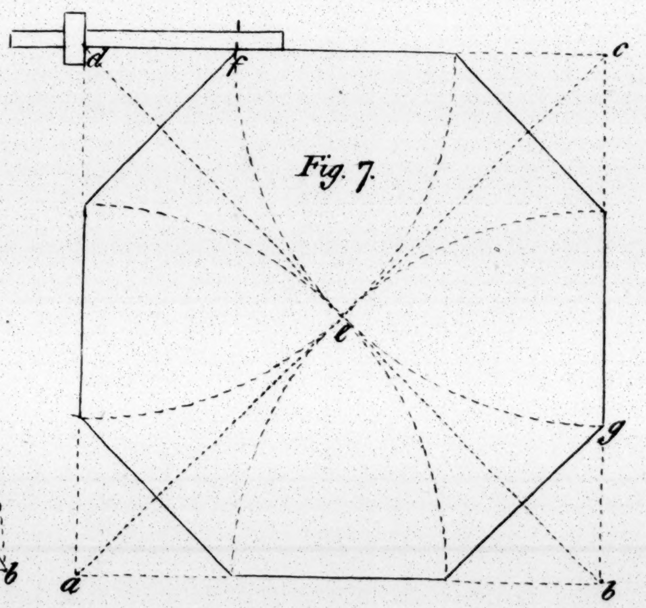

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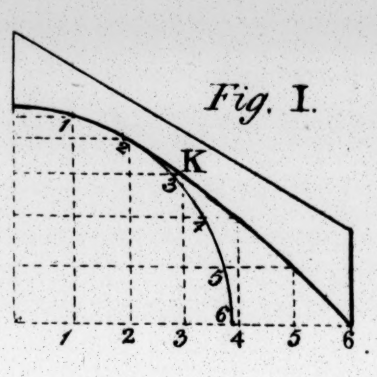

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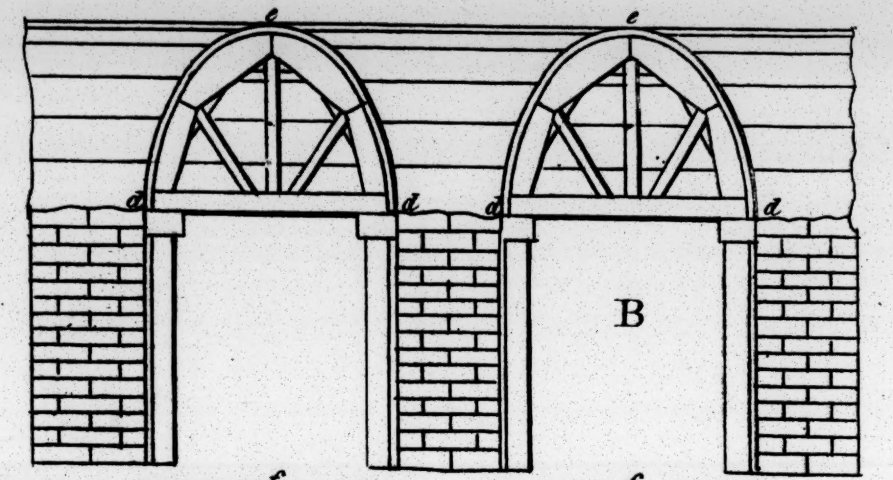

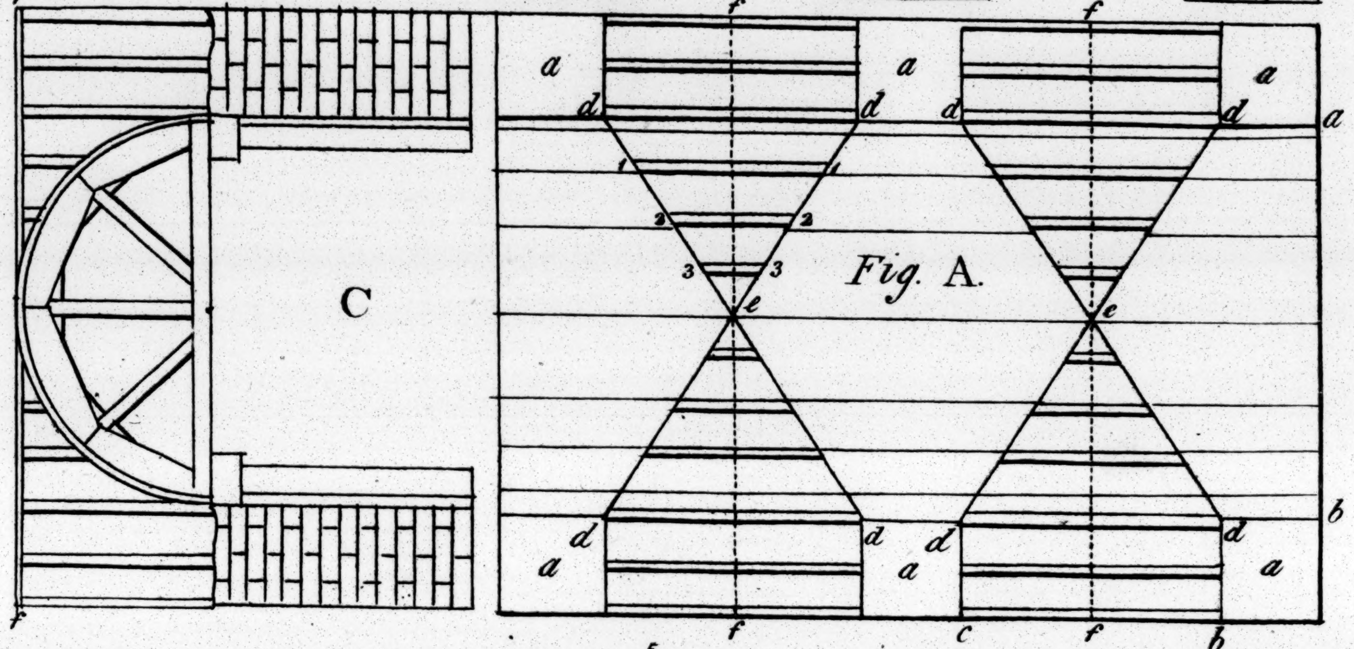

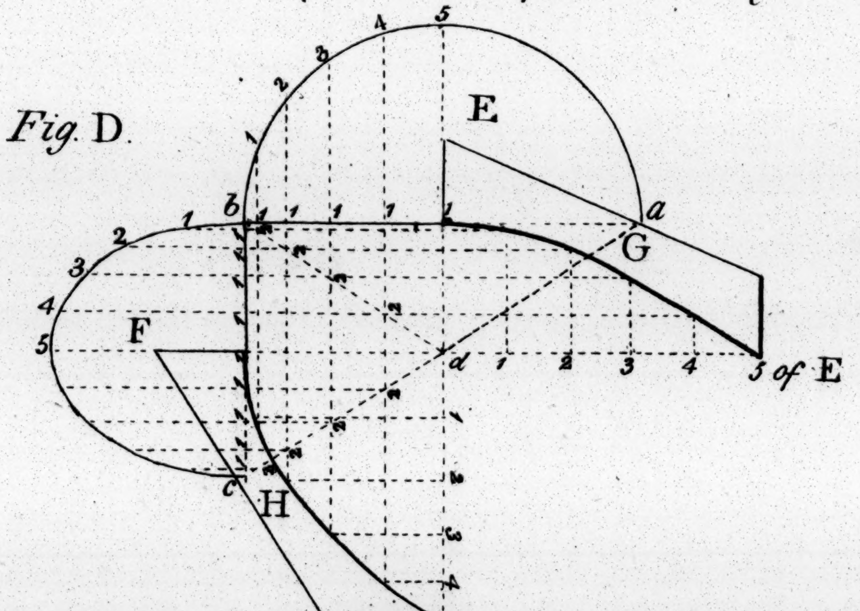

Fig. D.

Plate 5.

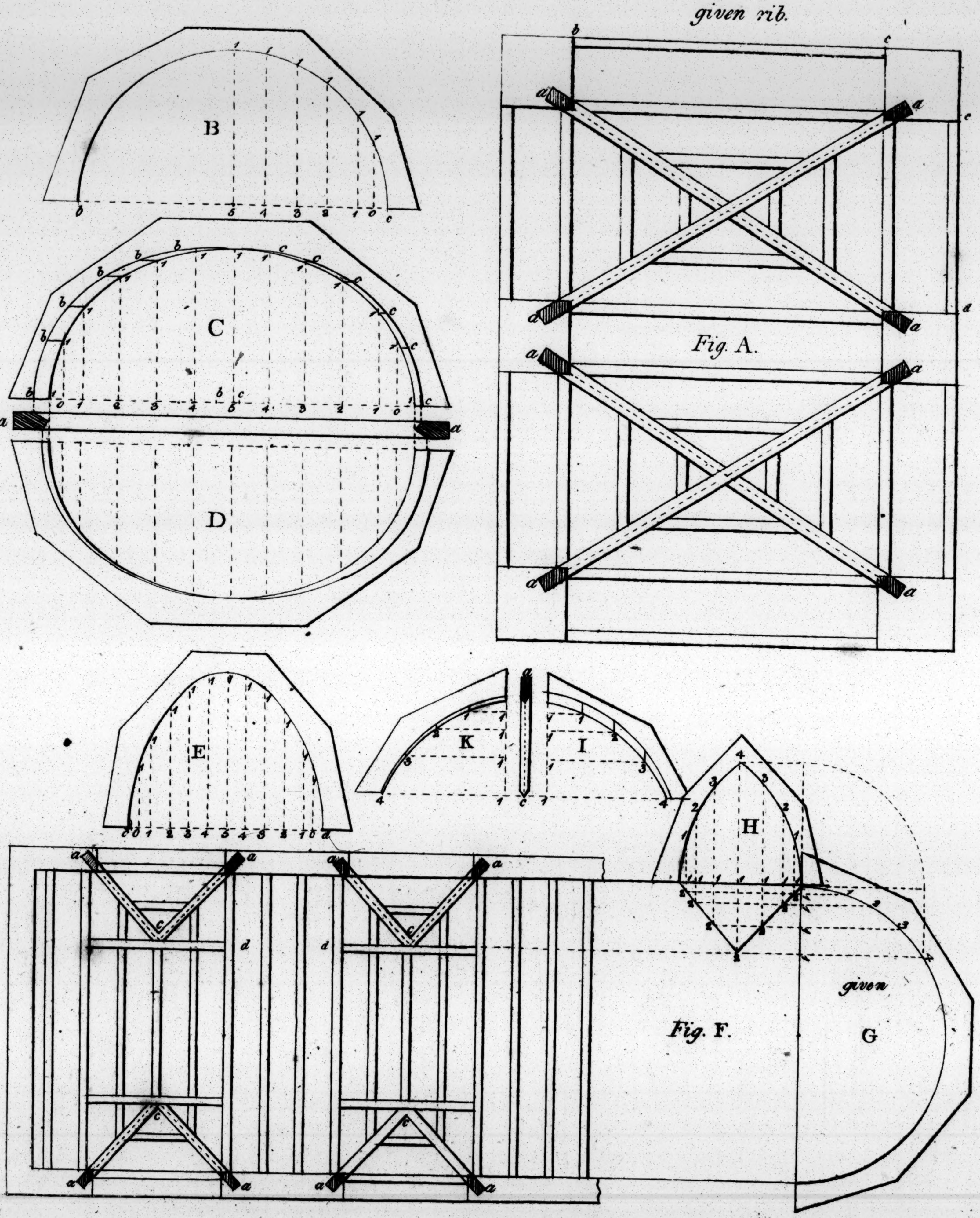

Plate 6.

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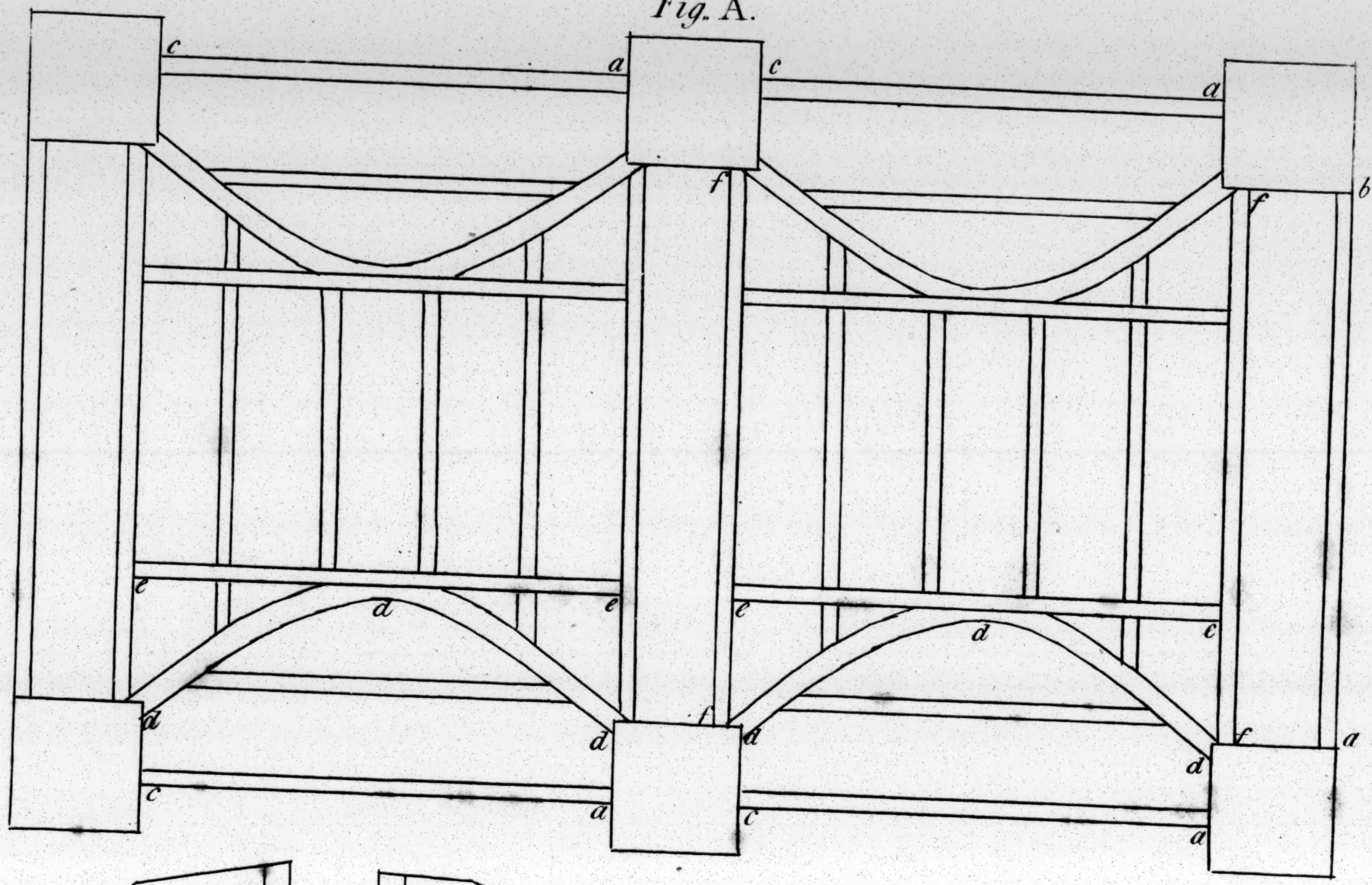
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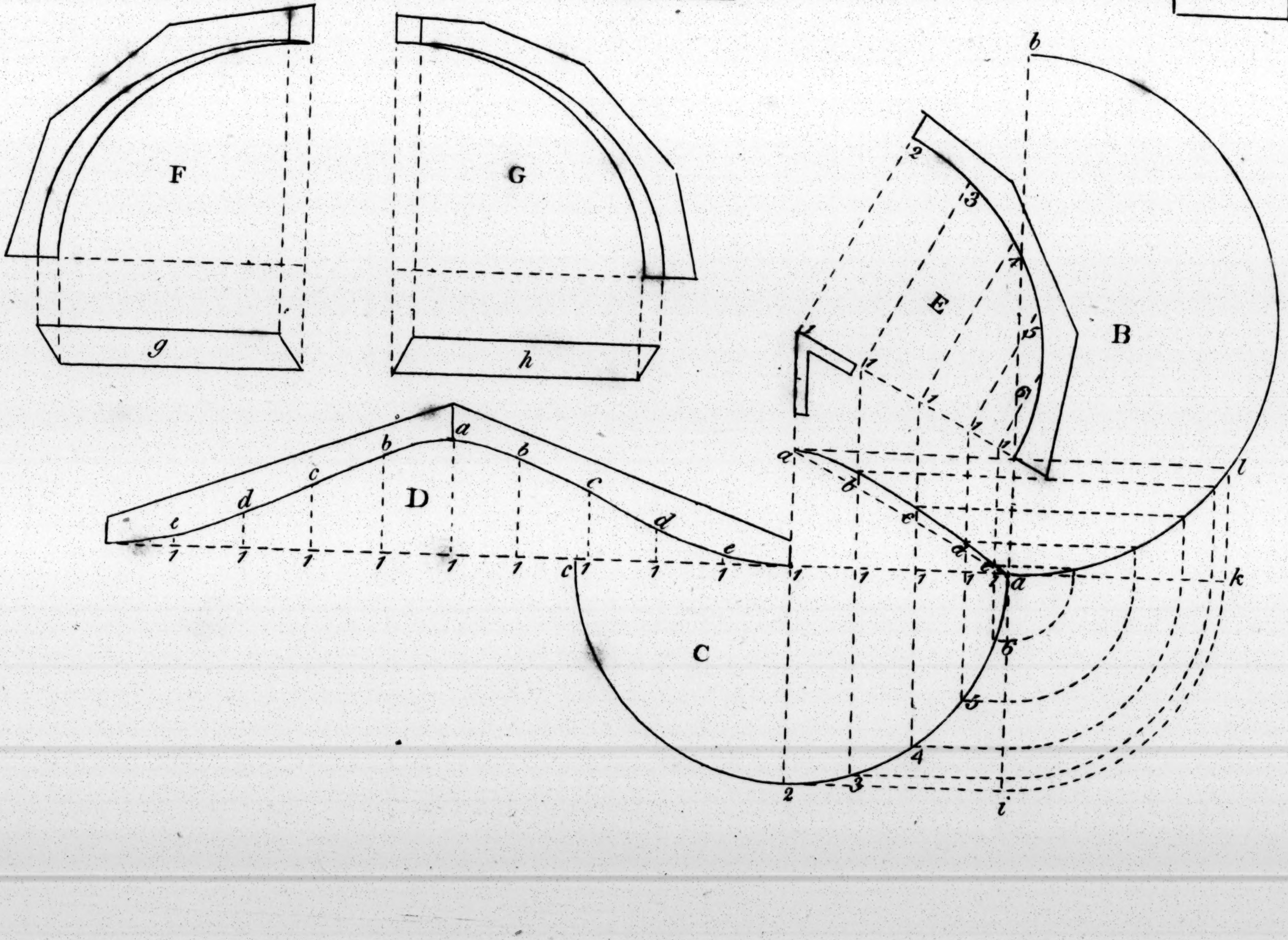
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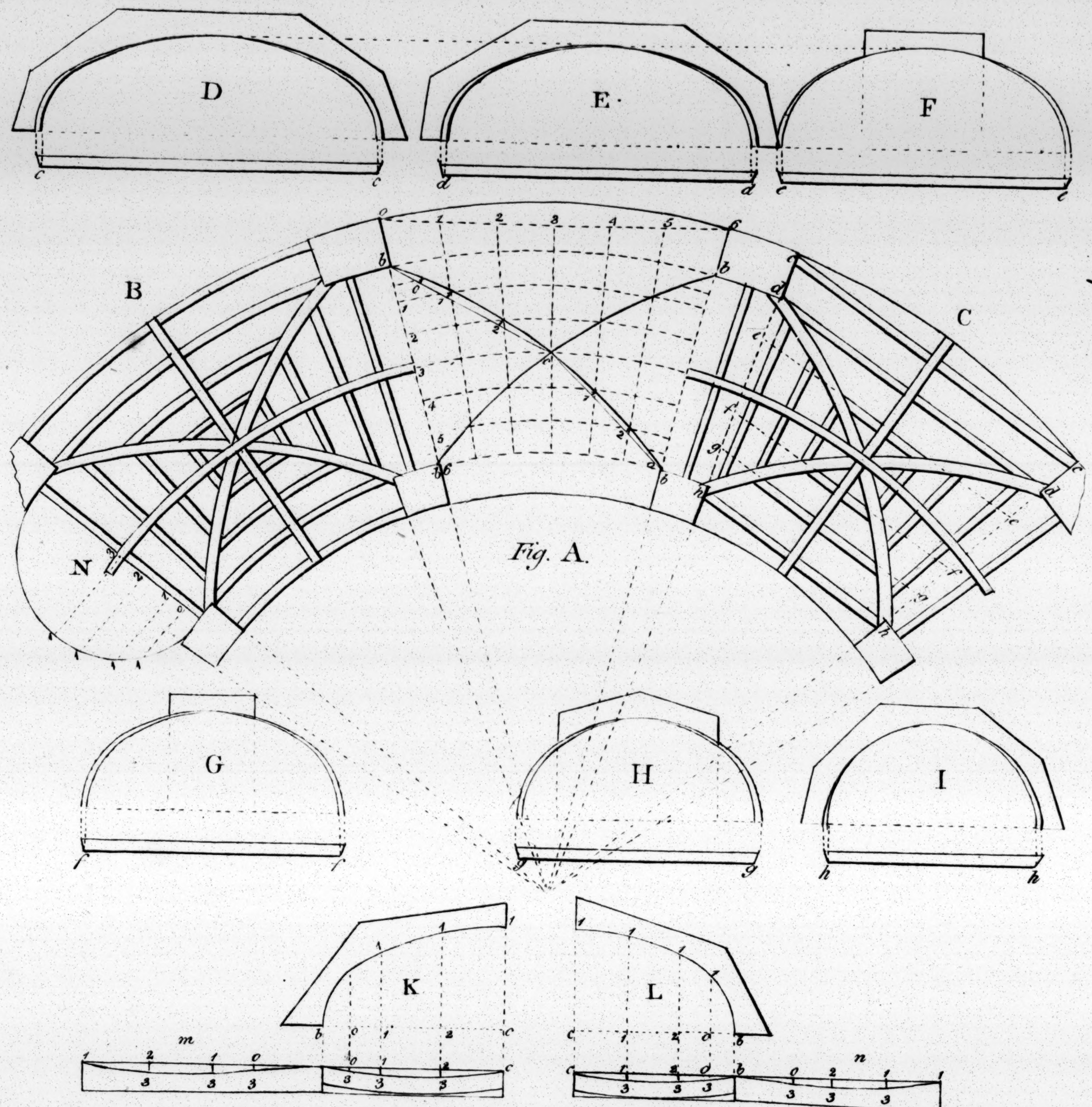
Plate 7.



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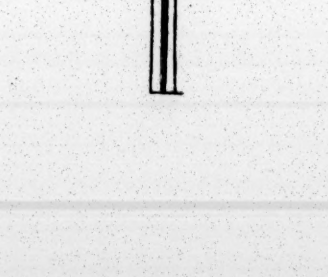

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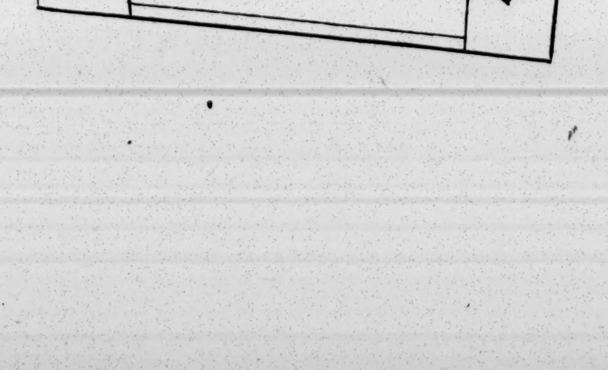

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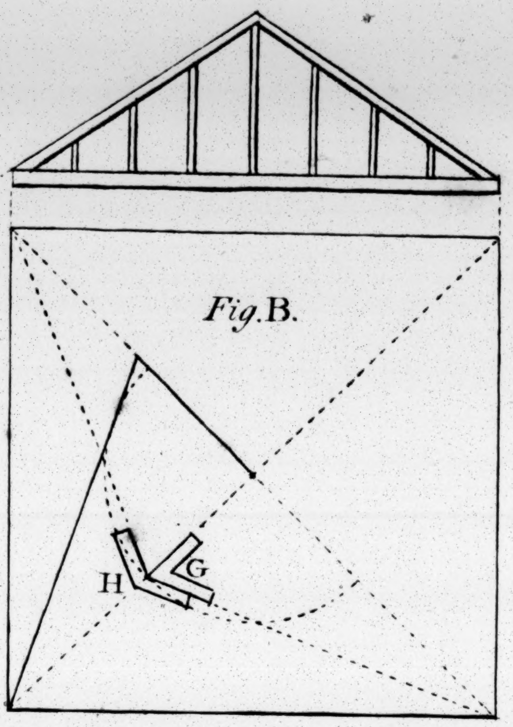

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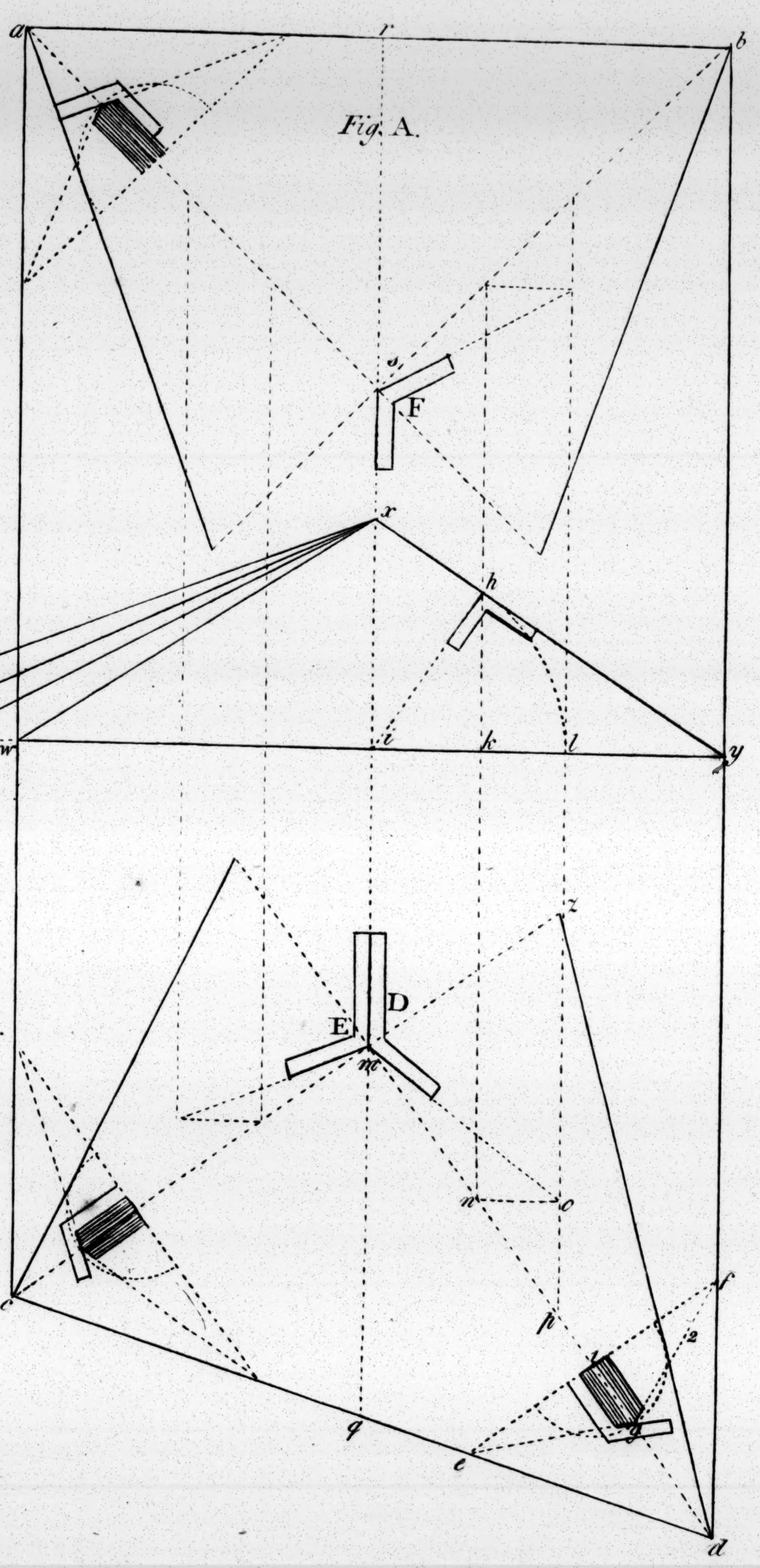

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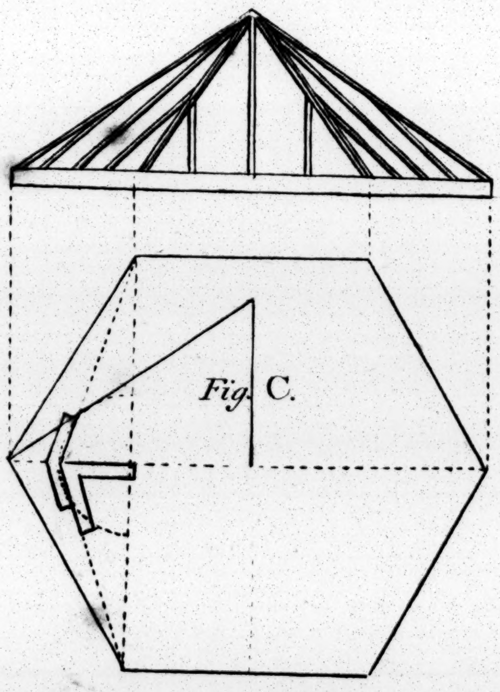
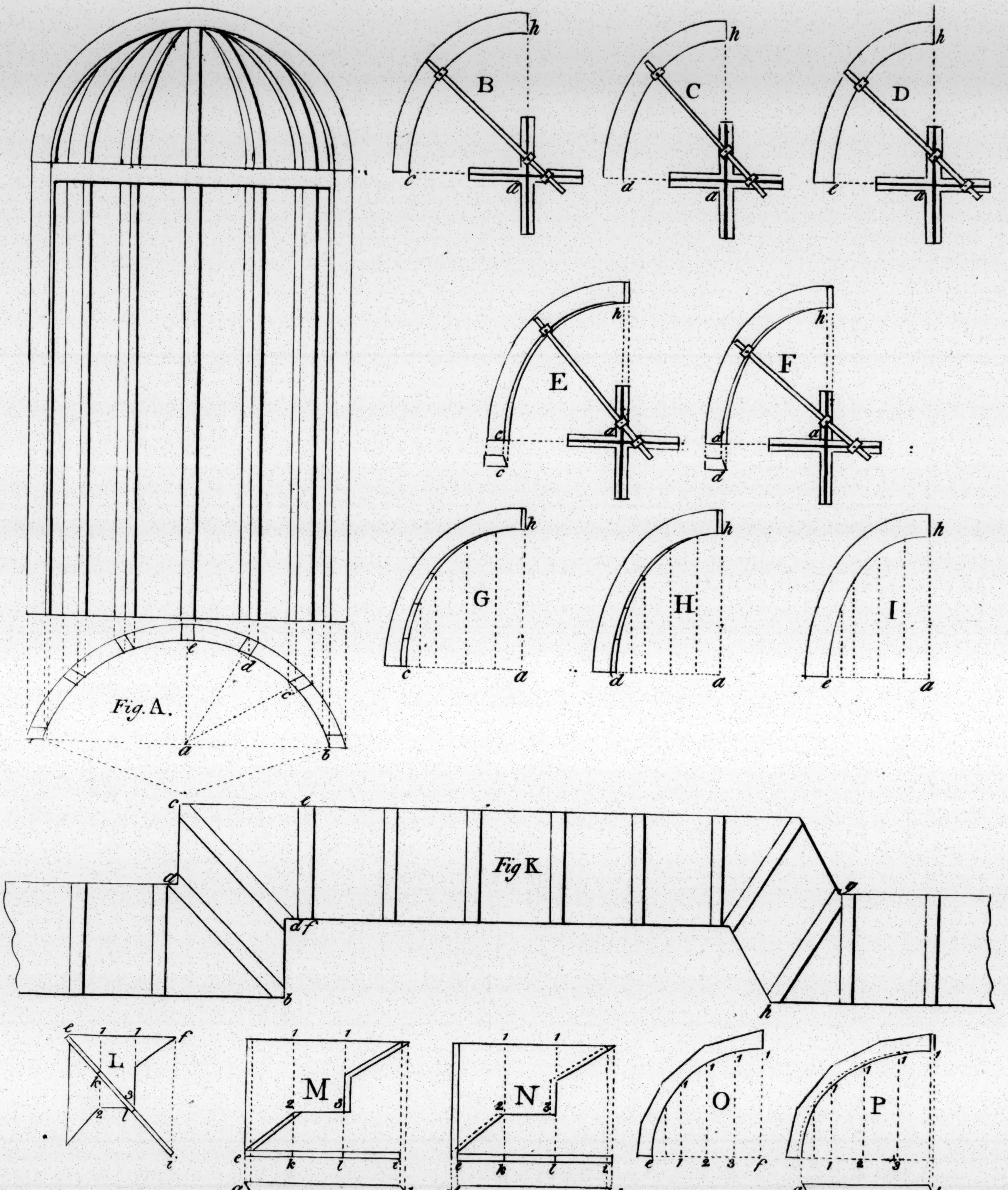


Fig. C.

Plate 9.



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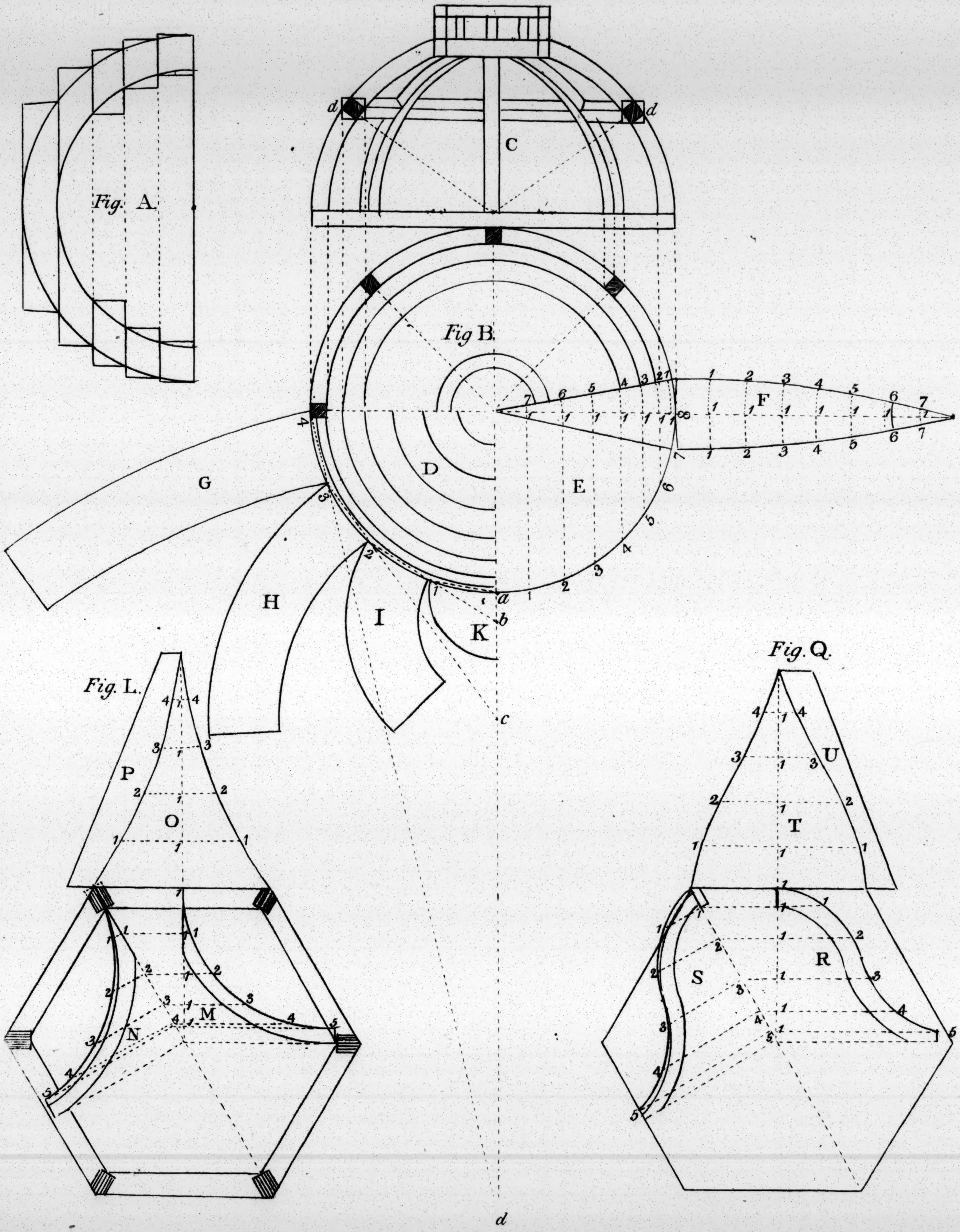

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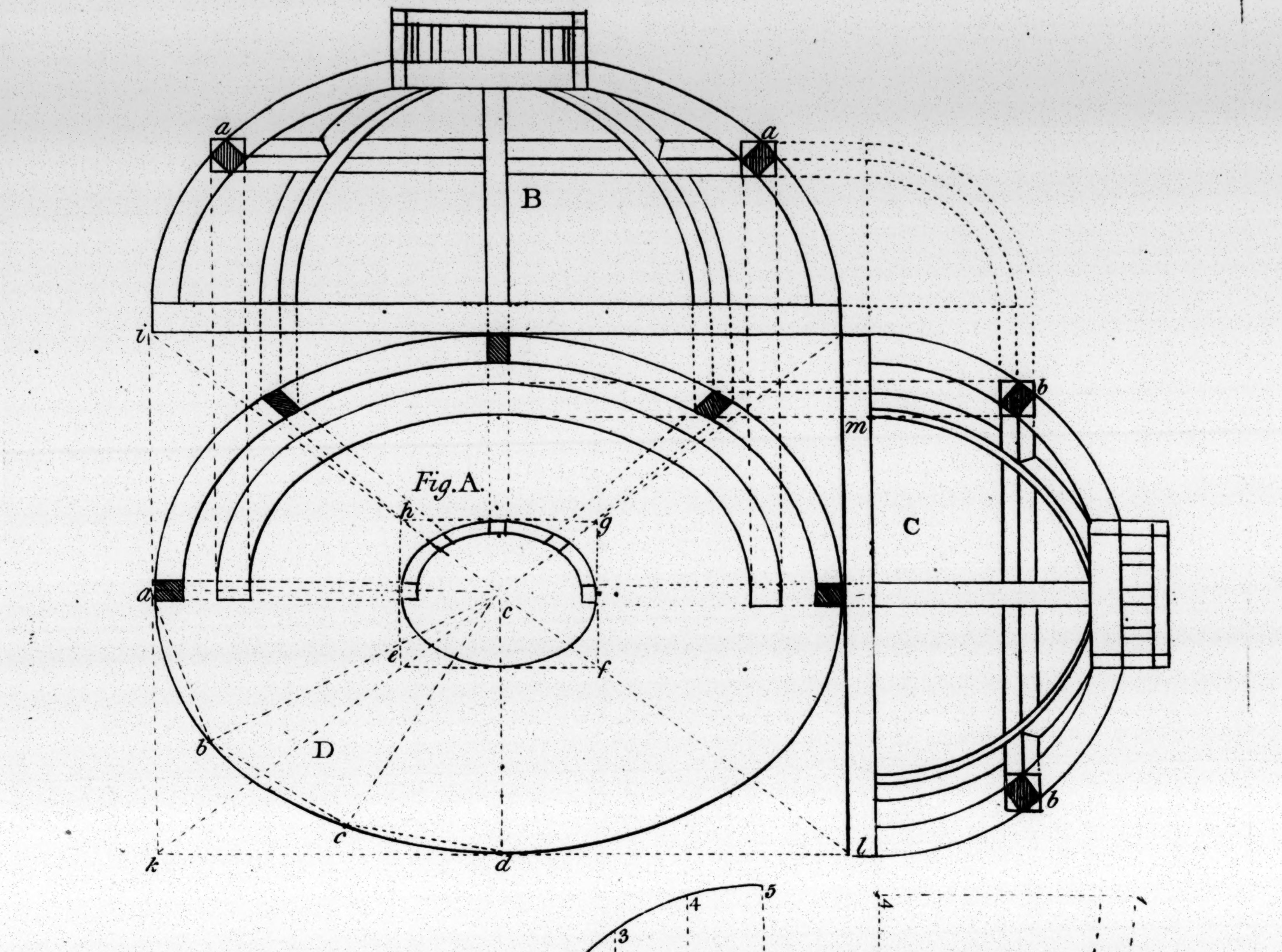

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Fig. A.
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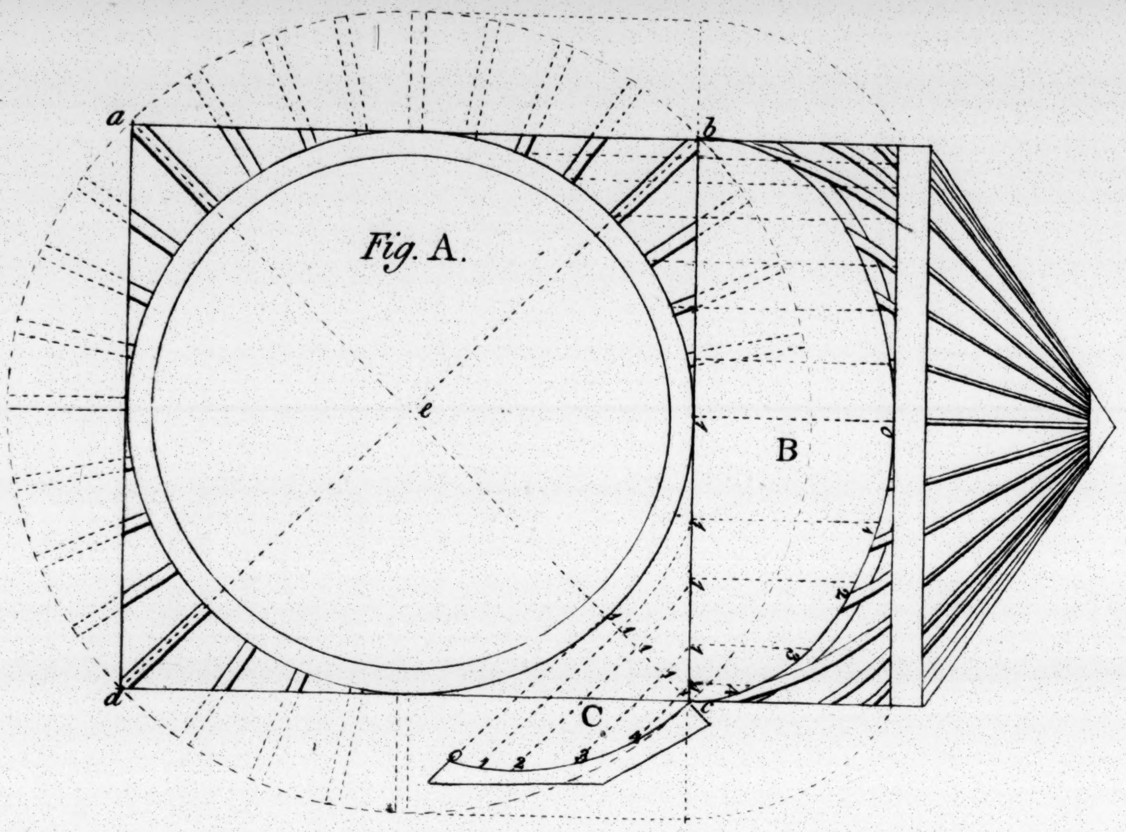

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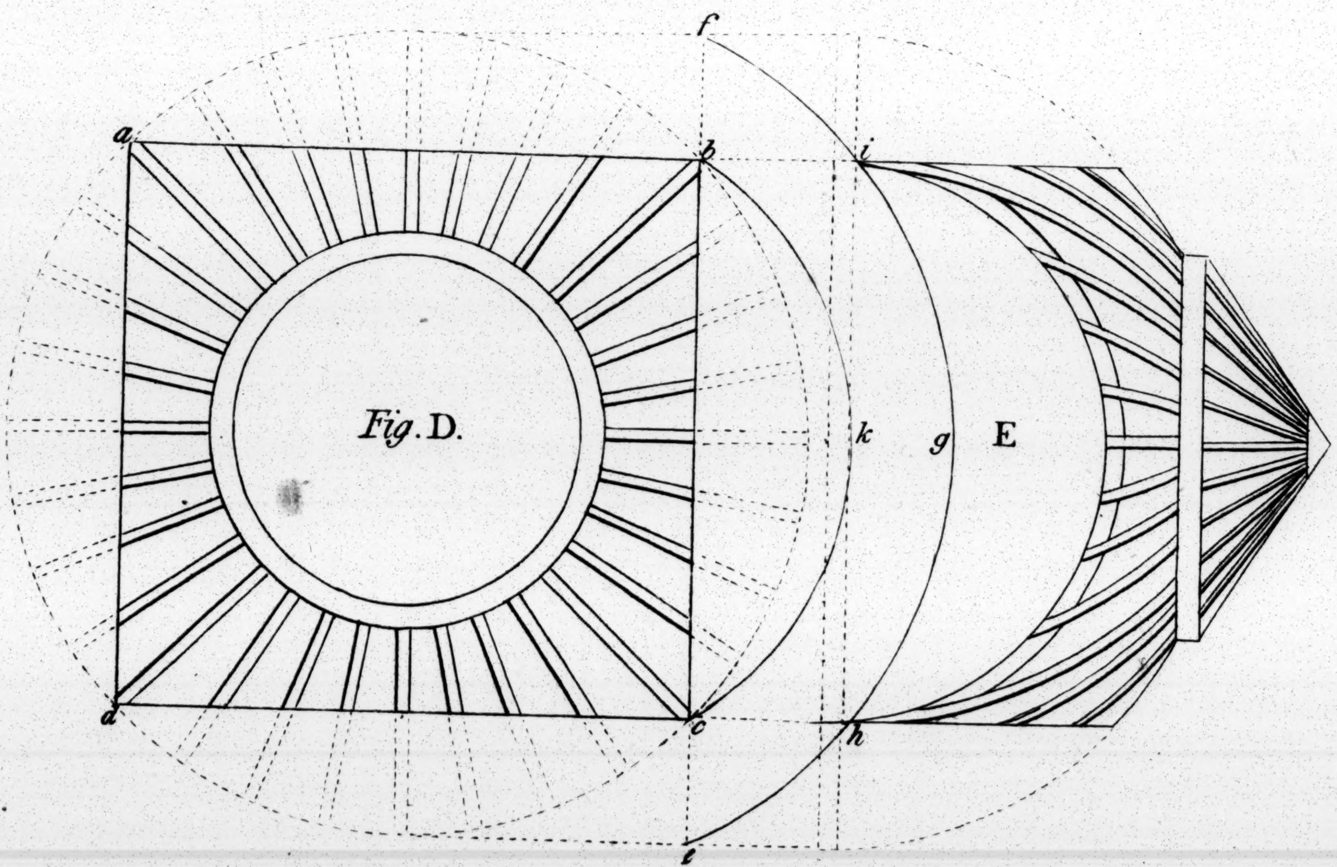
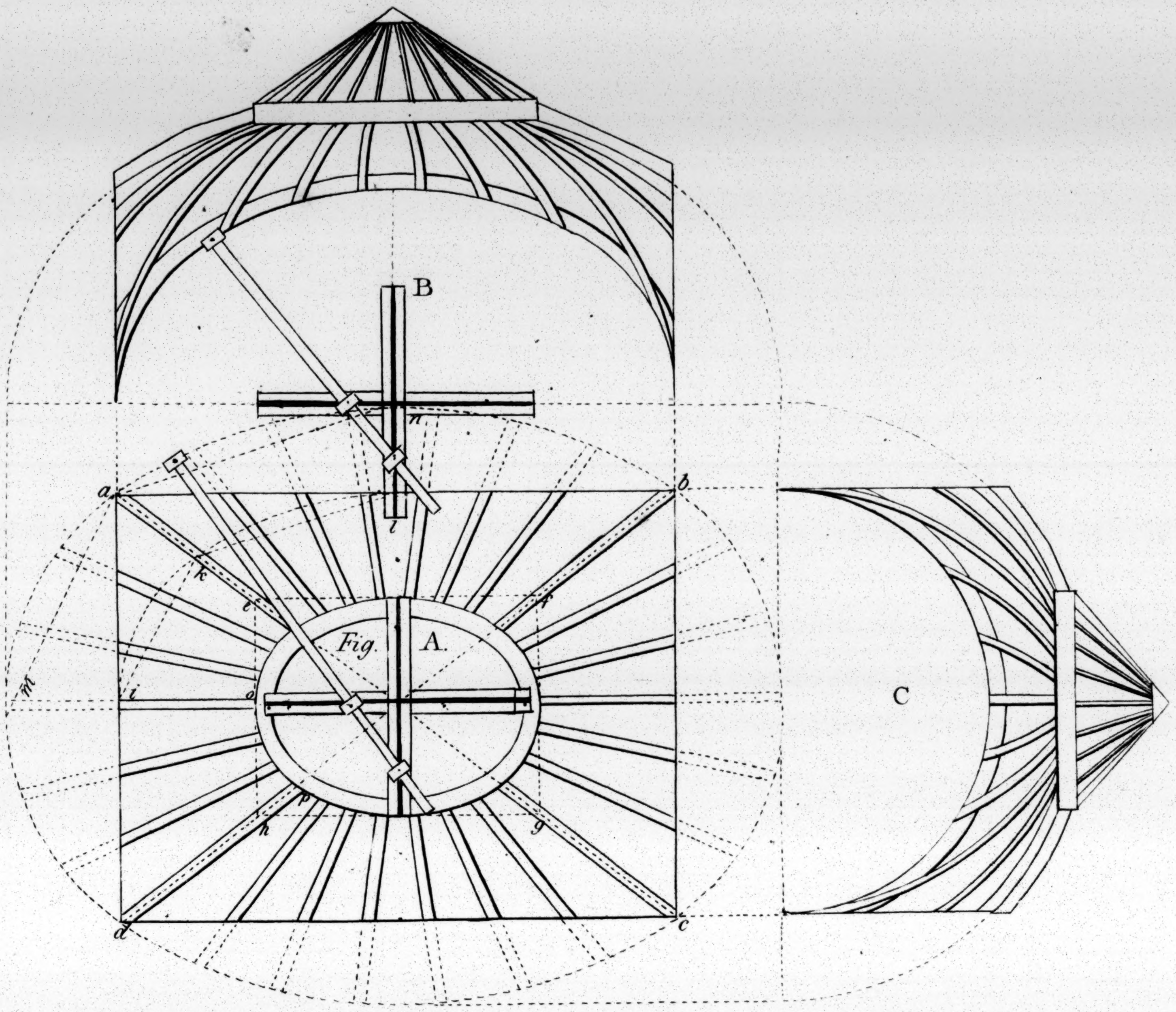
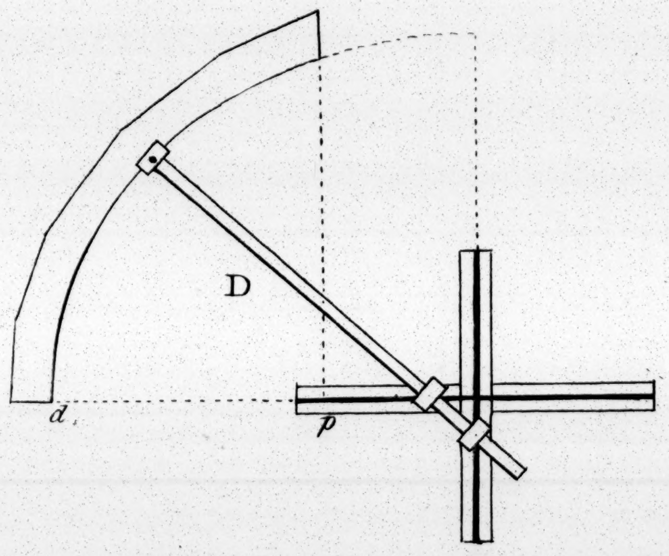
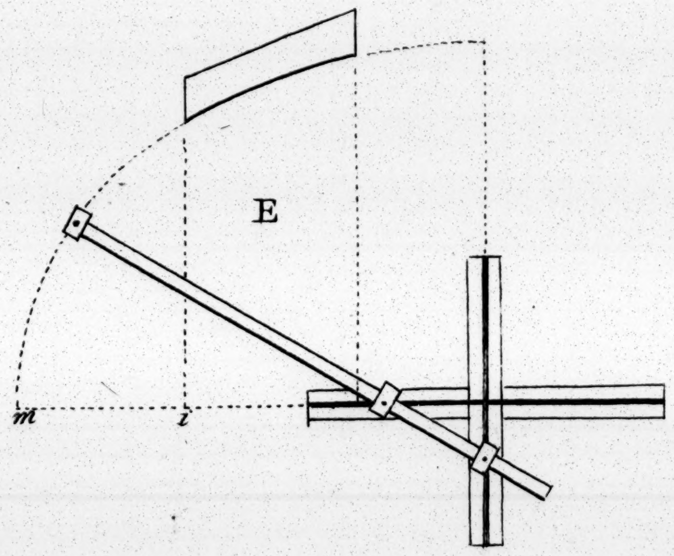


Fig. D.

Plate 13.







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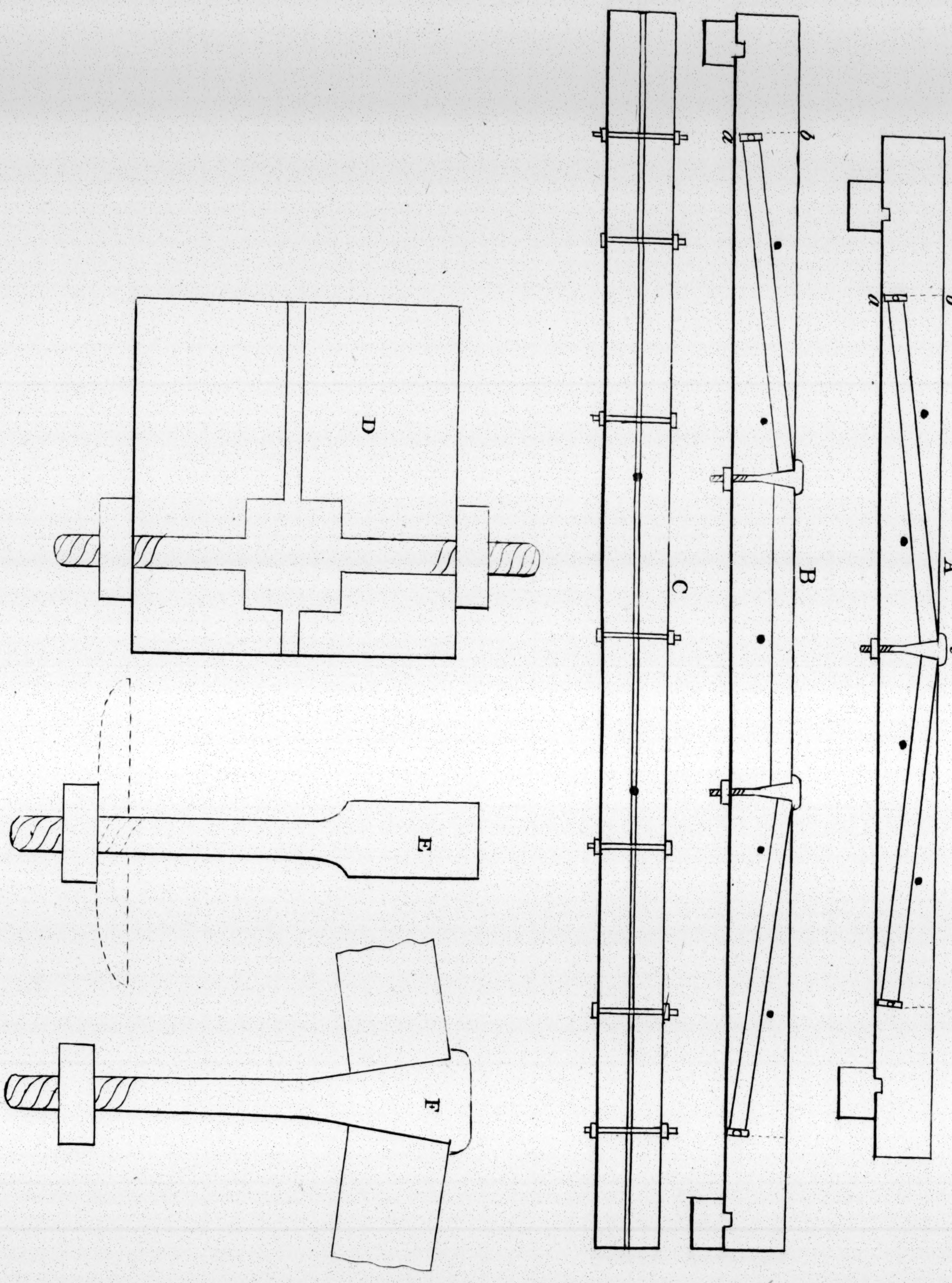
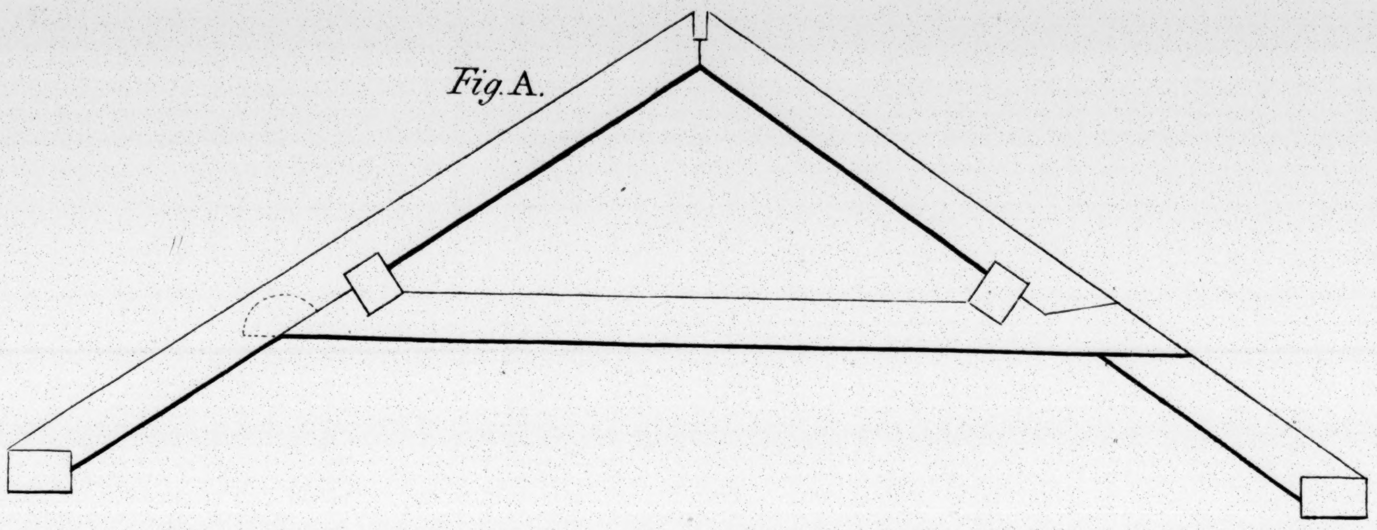


Plate 15.

Fig. A.



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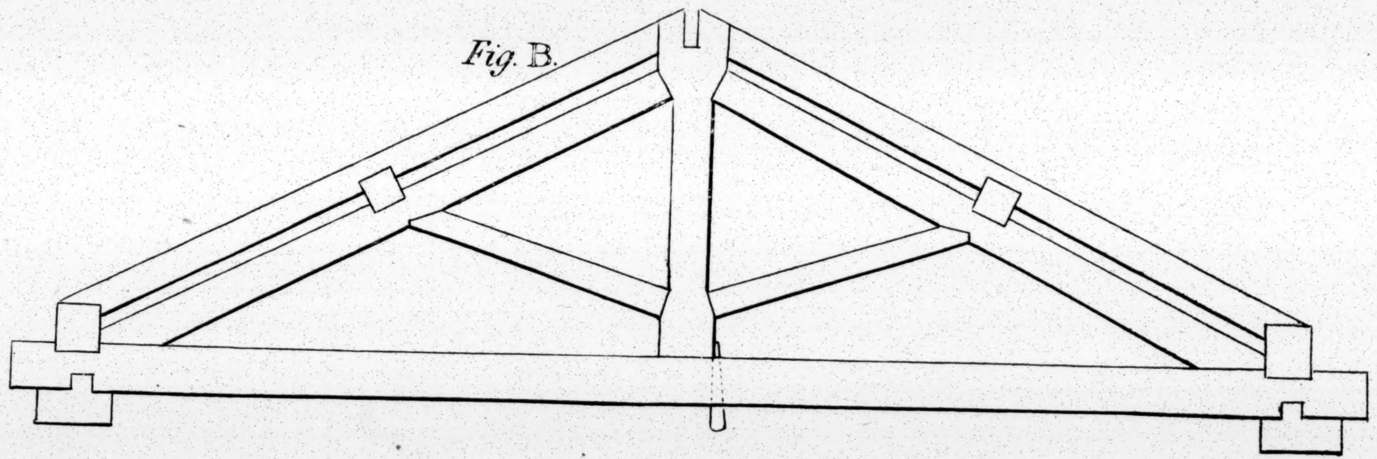

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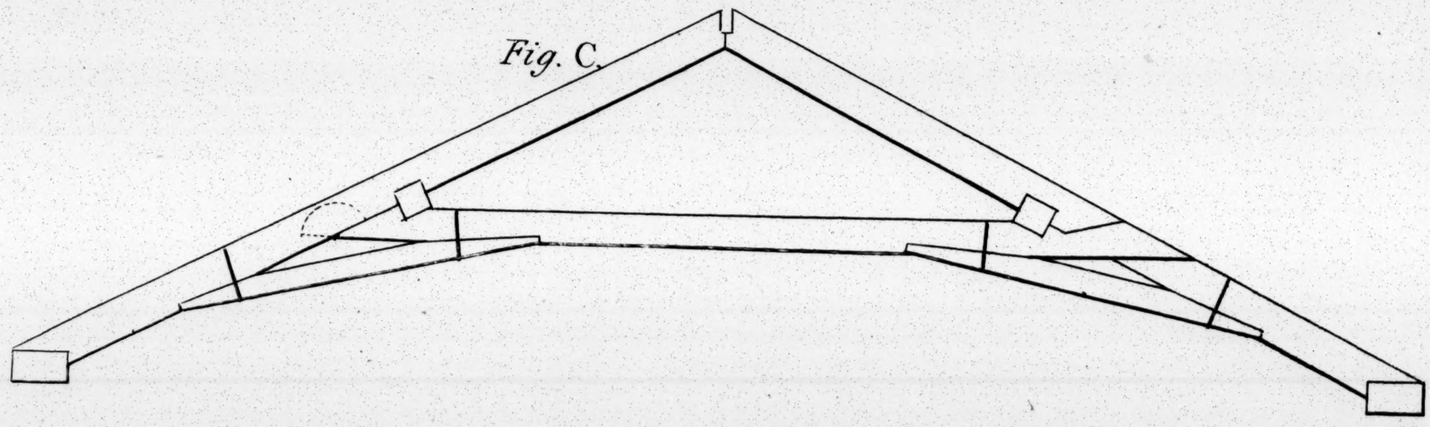
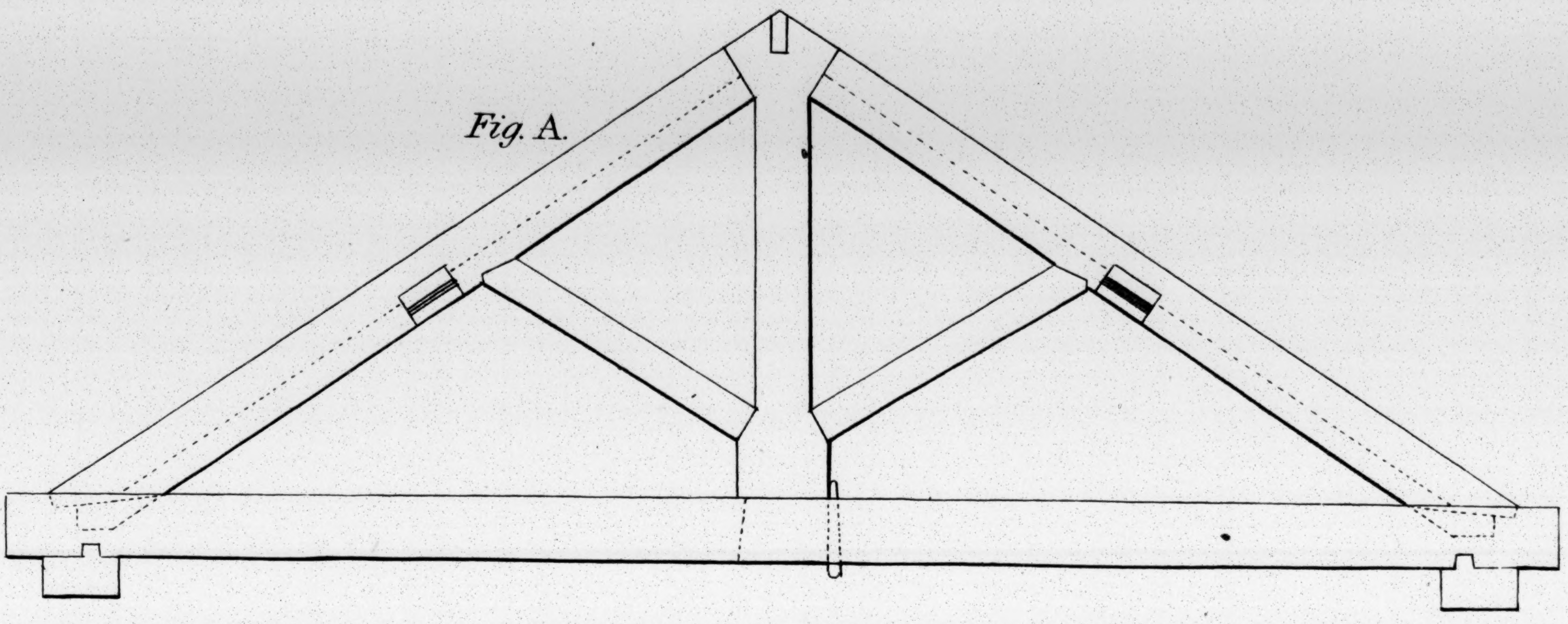


Plate 16.

Fig. A.



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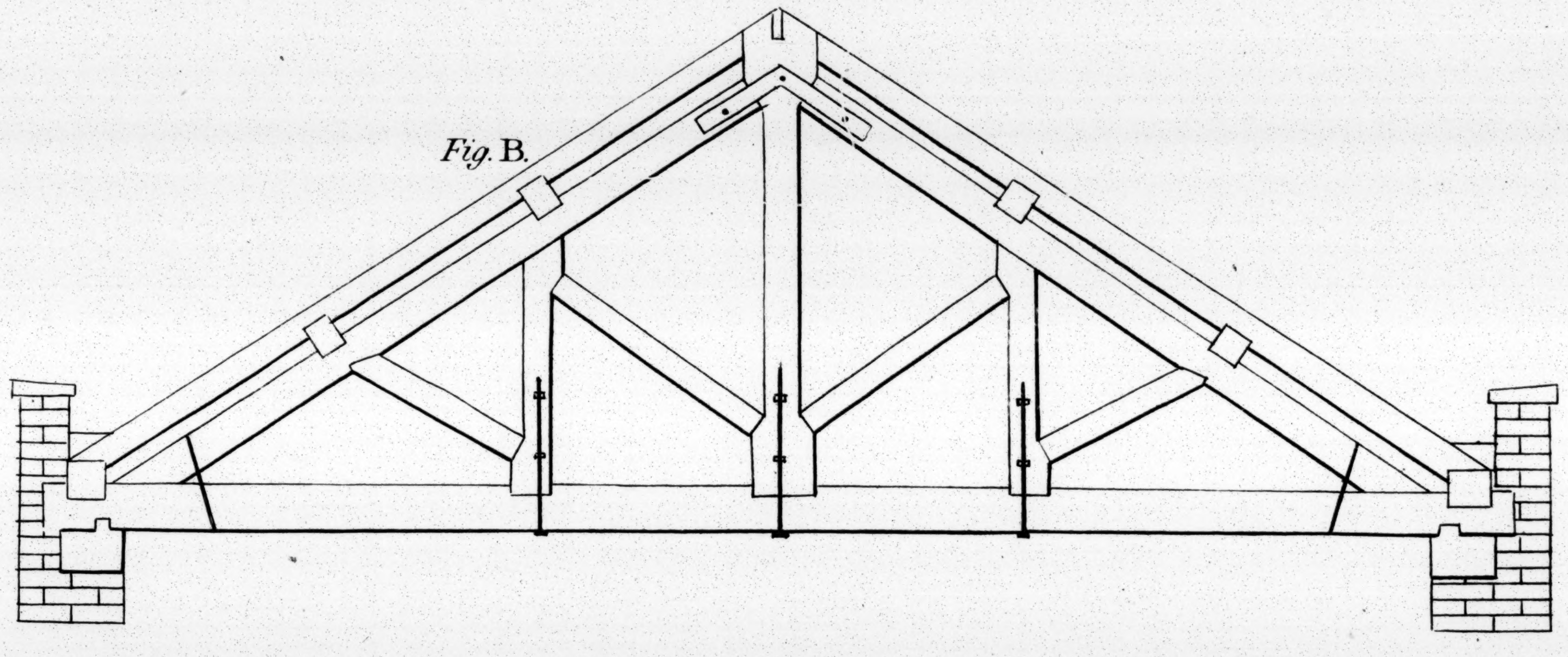

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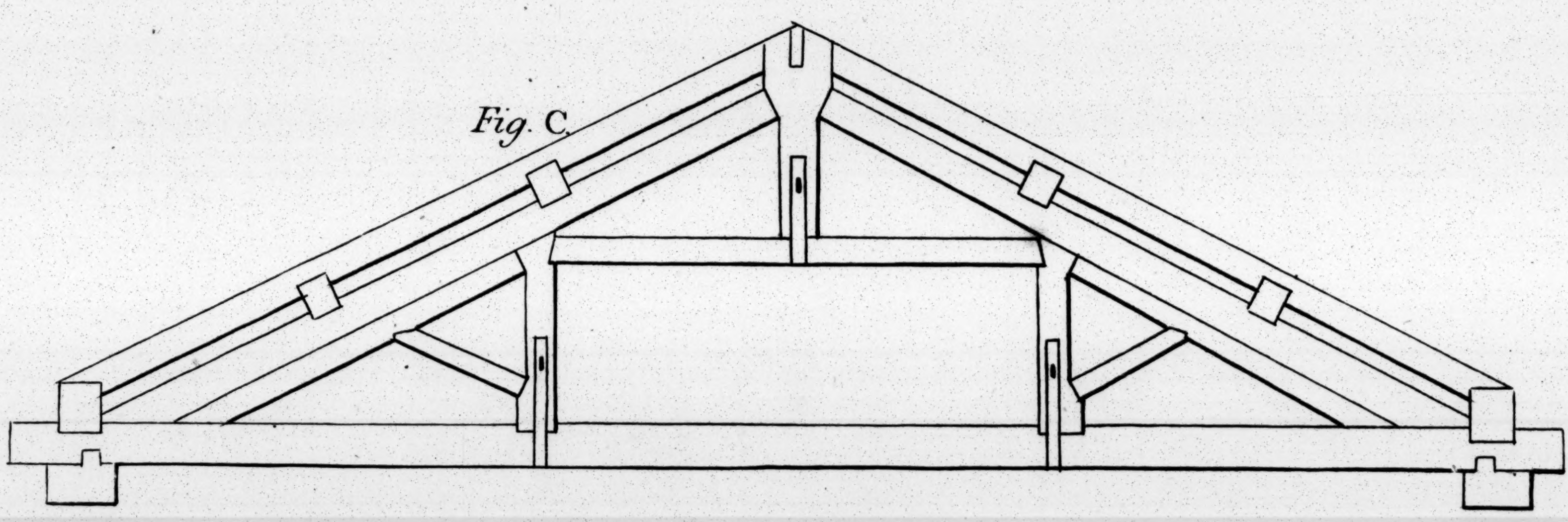

Plate 17.

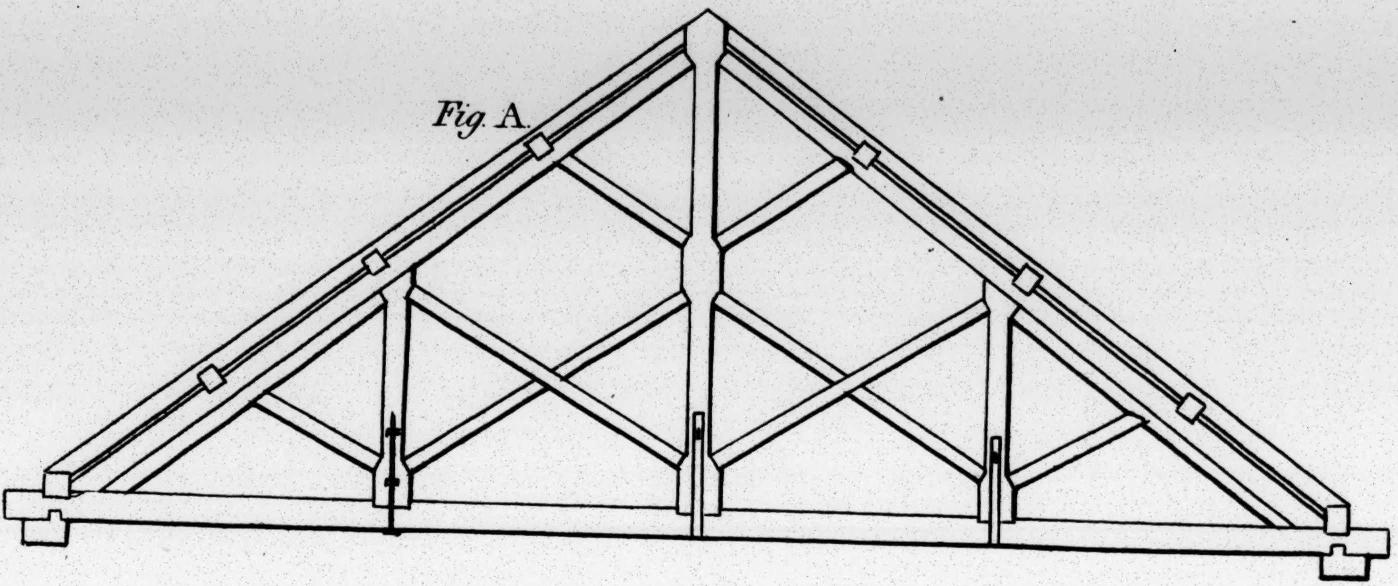

Fig. A.

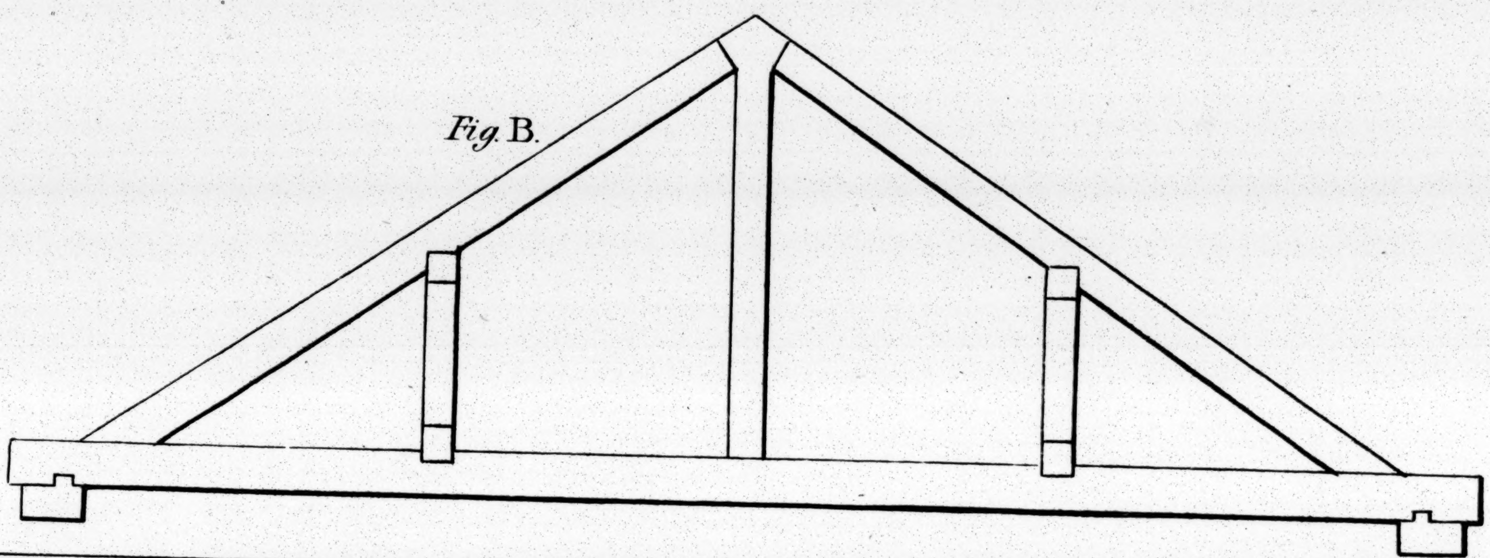

Fig. B.

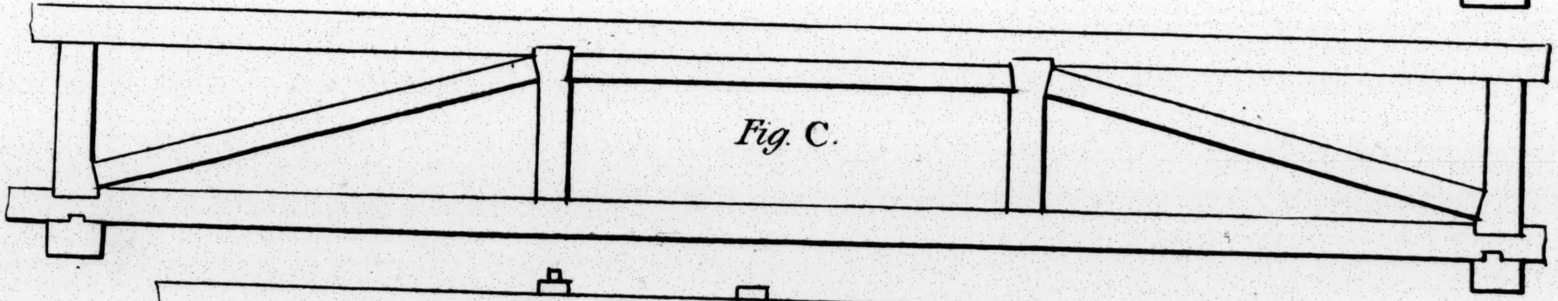

Fig. C.

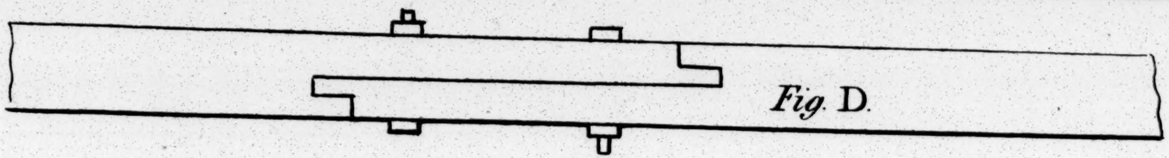

Fig. D.

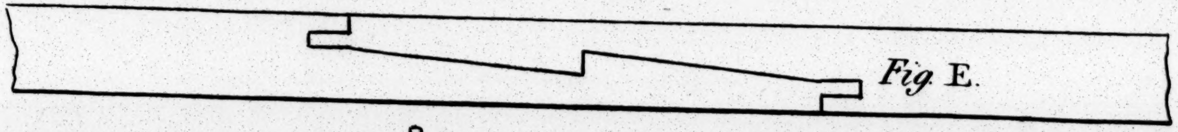

Fig. E.

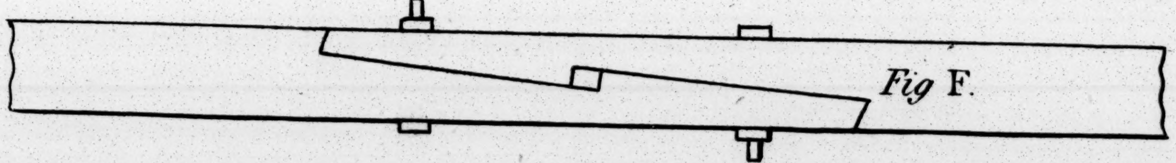

Fig F.

Plate. 18.

Fig. A.

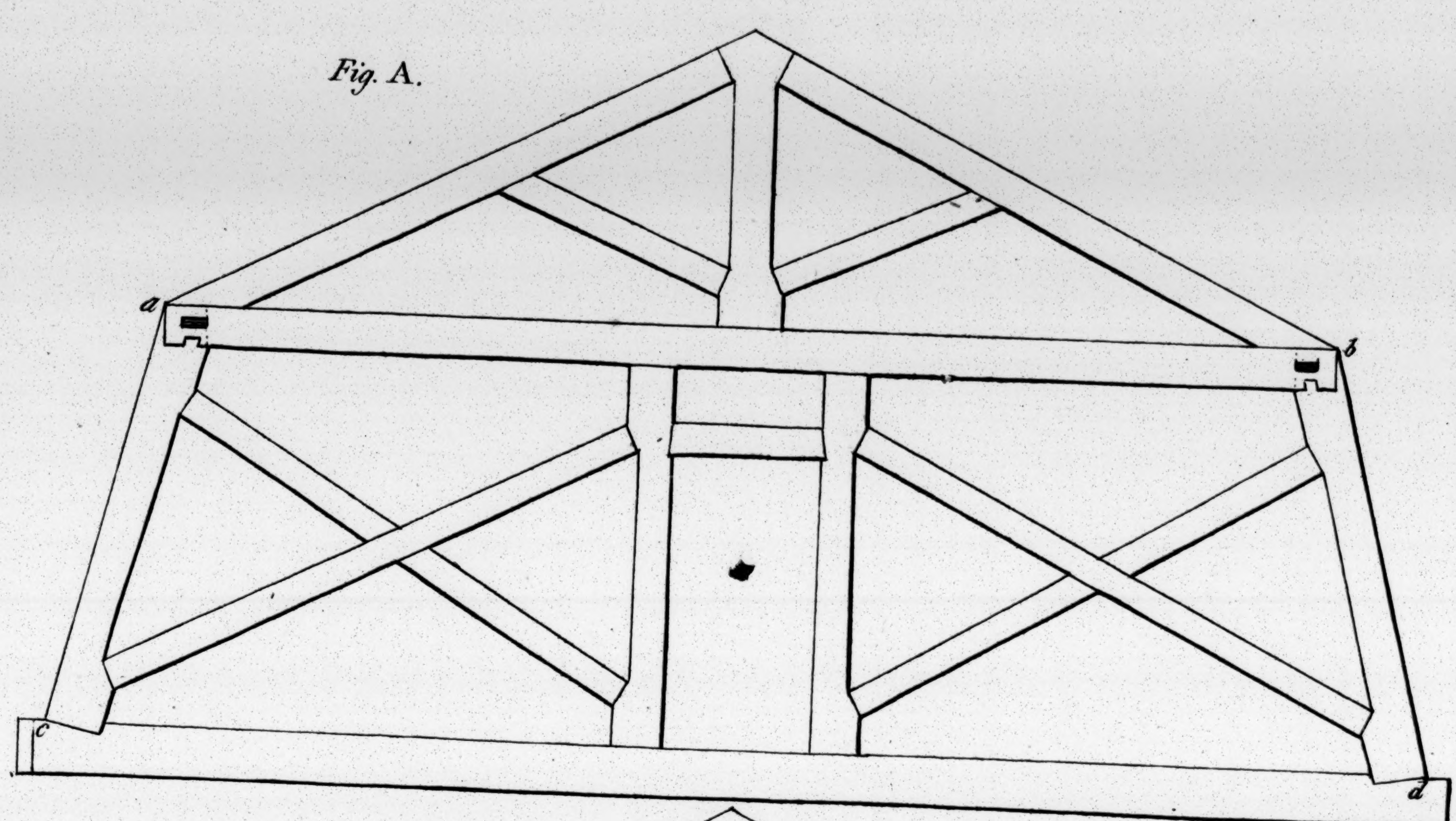

Fig. B.

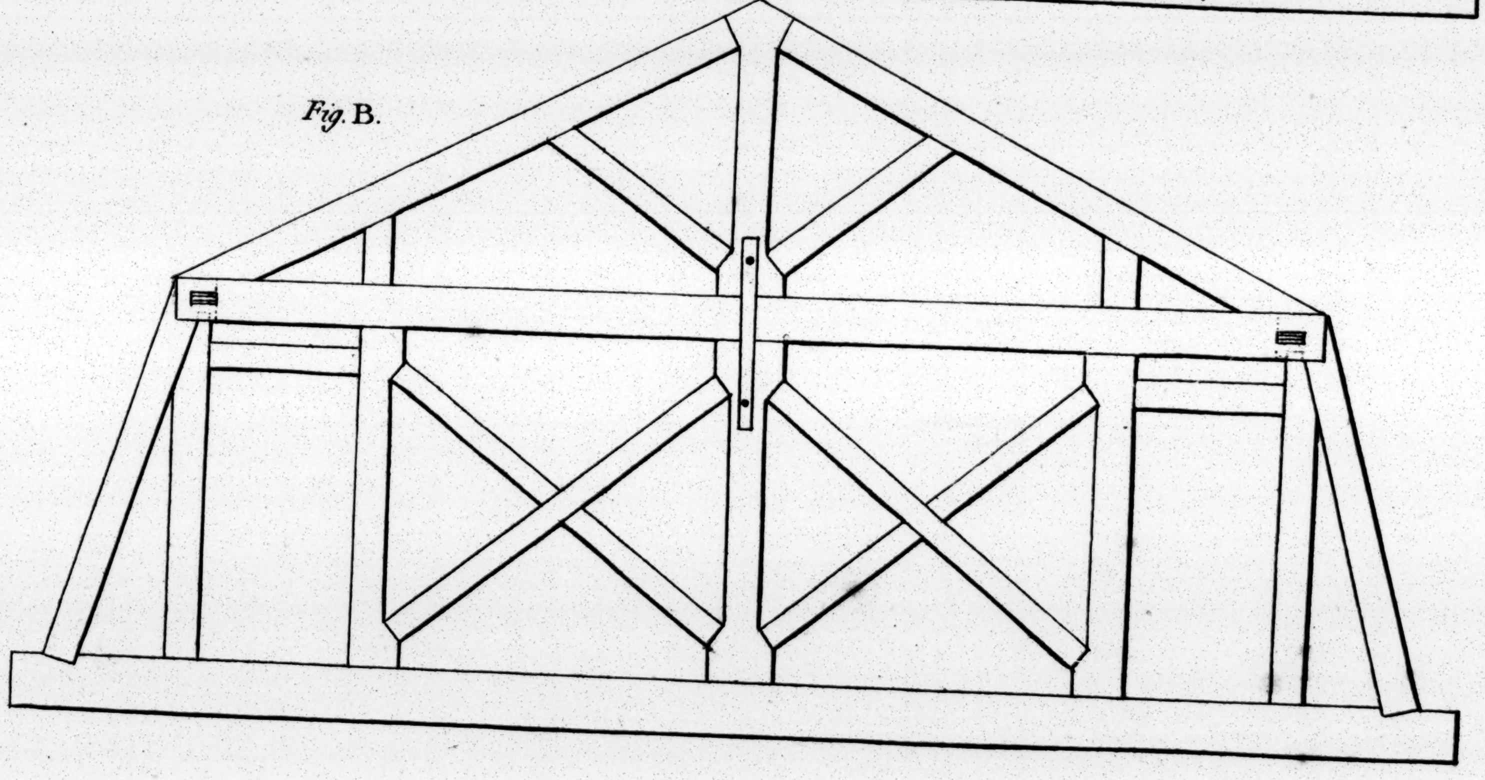

Fig. C.

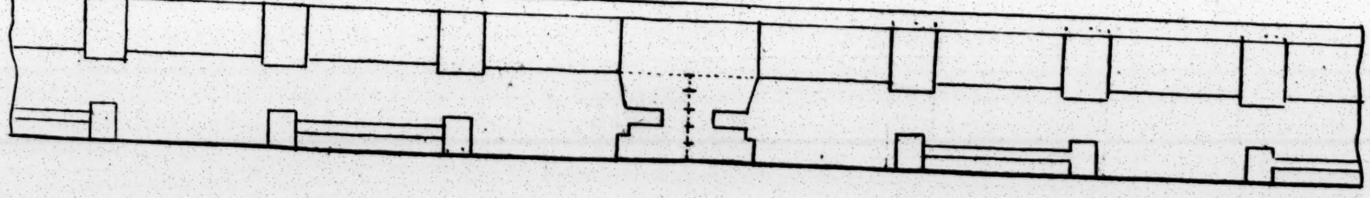

Plate 19.

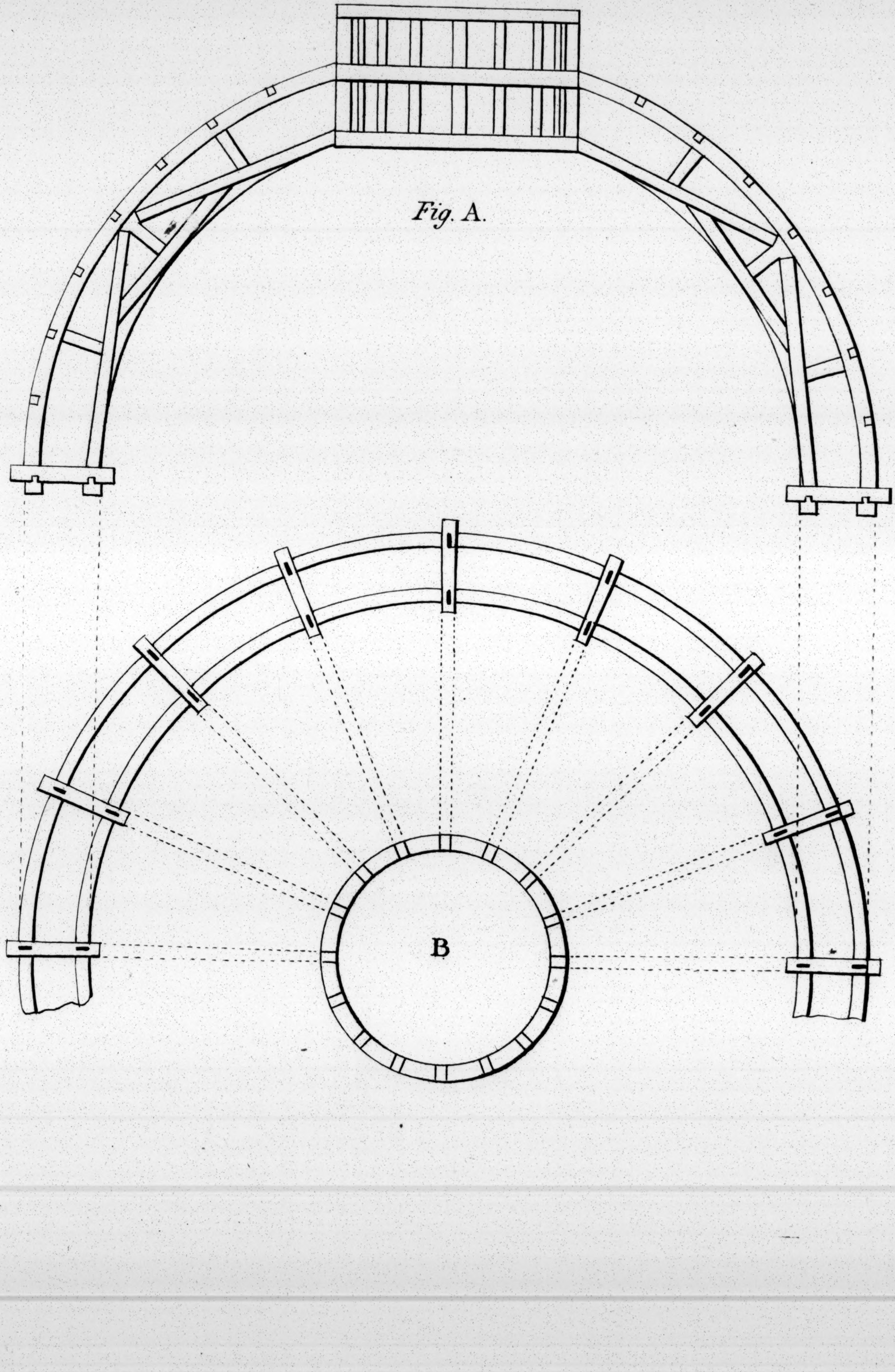

Plate 20.